

Comments received on Public Draft of “The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment”

The U.S. Global Change Research Program (USGCRP) released a draft report in April 2015 for a 60-day public comment period. During the public comment period, commenters provided input via a web-based system. A special committee of the National Academies of Sciences, Engineering, and Medicine also reviewed the report and published a consensus review that can be found [here](#).

Author teams considered each comment, provided responses, and revised the report. A set of eight independent Review Editors evaluated the responses to comments to confirm that the authors had read and considered all review comments and provided adequate written responses.

All commenter identities were hidden from the authors, Review Editors, and staff throughout the review and revision process to ensure anonymous review. All commenters consented that their names would be published with their comments when the report was final.

This file includes the comments received during the 60-day public comment period and responses. NOTE: the full report underwent several rounds of review after these responses were complete, and changes may have been made that are not reflected here.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
James	Wilhelm	This sentence states that "Future climate warming could lead to thousands to tens of thousands of additional deaths each year from heat in the summer, as calculated by extrapolating statistical relationships and without considering potential adaptive changes." Why would "potential adaptive changes" not be incorporated into this analysis, given the adaptive nature of our society (and, by obvious association, human beings) and willingness to utilize technological improvements to improve our livelihood (i.e., air conditioning, green infrastructure, etc.). This seems intellectually dishonest and a bit of a stretch to not incorporate some form of adaptive response.			5	16	The assessment does not include detailed discussions of climate mitigation, adaptation, or economic valuation. Consideration of greenhouse gas emissions pathways and human adaptive capacity (e.g. use of air conditioning) has been included as appropriate to assess projected climate impacts on human health. Thus no changes has been made to the text. See Front Matter and Introduction chapter for more information on consideration of adaptive capacity.
W. Scott	Lincoln	I appears as if Figure 3 (Hurricane-induced Flood Effects in Eastern and Central United States) is using point based observations and using an interpolation scheme to create a continuous map. The figure's caption is not very clear as to what is being shown; although it appears evident that orange and red values are likely more severe (which makes sense because they are closer to the coastlines), the actual values are not clear. What is the ratio? Qmax compared to what other quantity? The 2 year ARI event? The 100 year ARI event? The source document (Villarini et al. 2014) likely provides the necessary context to clarify this. It also may not be appropriate to display these point-based observations interpolated on a map. If this data is based upon gauging locations, the values would only applicable to the gauging point itself, and information between gauges would not necessarily be represented by interpolation schemes that cross watershed boundaries. A more appropriate display method may be to apply this symbology to the USGS watersheds that correspond to each point.	Ch 7: Extreme Events	3		291	The caption has been revised for clarity. For additional details on the methodology underlying the graphic, please see the cited source, Villarini et al. 2014.
don	Briggs	This entire document and premise is bunk based on some alternative agenda. Climate change is and always will be inevitable. To insinuate that it is human caused, controlled or re-mediated within our current ability is nothing short of criminal, fraudulent Machiavellian sociopathic intent. To stoop to the level of insinuation that the					This report was developed by USGCRP's Interagency Group on Climate Change and Human Health as part of the sustained National Climate Assessment and as called for under the President's Climate Action Plan. The National Climate Assessment has been mandated by Congress since 1990. The physical scientific

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		<p>health and survival of the human species is not only at stake, but the highest prerogative of conscience is nothing more than a classic demonstration of the depths that some are willing to pursue for profit and gain at the expense of the gullible masses.</p> <p>As history has repeatedly evidenced, a single solar event, major volcanic eruption, earthquake or meteoric impact will have far greater and long lasting influence than humans could ever possibly introduce to this planet.</p> <p>We have have an obligation to live harmoniously and responsibly within the constraints or our ecosystem and resources. To try and legislate/regulate for the profit of a few at the expense of the many is deserving of more than a public old fashioned tar and feathering of the perpetrators.</p> <p>If the interest truthfully and genuinely lies in the well being of the species, innovation, education and compliance, without opportunity for profit or gain by any entity, party or individual to live within our means is the only viable course to be considered and pursued.</p> <p>How many hard earned, tax payer dollars contributed to this travesty of crap?</p>					basis behind climate change and the anthropogenic influence on recent climate change is discussed in the third National Climate Assessment (NCA3). The assessment does not include detailed discussions of climate mitigation, adaptation, or economic valuation.
richard	ross	This entire chapter needs to be removed. Since when is this money making & elite empowerment lie about our climate become about race or ethnicity??!!!! This section is just another "chapter" in the book of this government's will to control people & their views of our world, & to have them fund it. The funny thing about a lie, is its always changing or evolving to fit the circumstances in which it's being portrayed, & that in order to further itself.	Ch 9: Populations of Concern				The authors disagree with this comment. No citation(s) is provided that would substantiate the commenter's assertions.
richard	ross	This entire document needs to be removed from existence. Since when is this money making & empowerment lie about our climate become about race or ethnicity??!!!! The so called climate agenda is this government's will to control people & their views of our world, & to have them fund it. Now this administration has gone so far as to try & cause division among it's people over weather by introducing race to the discussion?!! Unbelievable! Additionally, when did this administration or government figure out how to predict weather patterns in such a way that it's so sure of itself so					This report was developed by USGCRP's Interagency Group on Climate Change and Human Health as part of the sustained National Climate Assessment and as called for under the President's Climate Action Plan. The National Climate Assessment has been mandated by Congress since 1990. The physical scientific basis behind climate change and the anthropogenic influence on recent climate

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		<p>as to run & tell the people the sky is falling? If that's the case, then from now on I'm sure the federal government will save everyone from any tornadoes, floods, lightning strikes, hurricanes, etc. You get the point.</p> <p>The means justify the ends, right?</p> <p>The funny thing about a lie, is its always changing or evolving to fit the circumstances in which it's being portrayed, & that in order to further itself.</p>					change is discussed in the third National Climate Assessment (NCA3). The assessment does not include detailed discussions of climate mitigation, adaptation, or economic valuation.
Andy	OUIMETTE	<p>It's clear that the studies regarding what to do when the climate increases in temperature and what will potentially happen are the primary focus of this release, I find it concerning the lack of actual data to support your presumptive conclusion that direct human impact from controllable sources is responsible, yet is the core driver to everything else in your paper. The paper seems to skip right over the details and presents the information in a presumptuous way.</p> <p>Until you put the data and actual models first, and can accurately represent the past by your models given data we've measured, then your paper and conclusions are simply speculation. It's good to be prepared for a warmer future, but how long will it be before it gets cold again? Judging from historical record, we're approaching a climactic state apart from potential human caused variation.</p> <p>I personally wonder if I'll be alive for the steeper cool down period to follow the warming, that I fear may be more detrimental to society than warming. How much will we disrupt that natural cooling cycle with intentionally induced cooling? Will we be able to control it? Unlikely given our current state.</p>					The physical scientific basis behind climate change and the anthropogenic influence on recent climate change is discussed in the third National Climate Assessment (NCA3).

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Bill	Shiner	Key finding should result in [Likely, High Confidence] rather than [Medium Confidence]	Executive Summary		15	15	All Key findings have been reviewed and revised to ensure consistent use of confidence and likelihood language, as outlined in the author guidance.
Emily	Began	The research for infiltration and indoor air does not seem to take into account the inevitability for an increase in air pollution between the two time frames. The main focus is on how climate change will affect exposure, but how would more of the same pollutants, or the introduction of new pollutants affect exposure to indoor and outdoor air pollution? With this in mind, infiltration caused by climate change can be monitored more accurately.	Ch 3: Air Quality		97	30	After consideration of this point, we still feel the existing text is clear and accurate.
maggie	kraft	Stated in the report on line 36, there is a pretty large difference in potential temperature increase (around 6 degrees fahrenheit). Since there is such large unclarity, how do we know the extent to which the negative health effects from climate change will occur? Will there be a large difference between health effects at a 2.7 degree increase vs. an 8.1 degree increase? If so, what are the difference in health implications?	Ch 1: Preface and Introduction		36	36	Thank you for your comment and questions. The commenter is referred to the chapter on temperature extremes, where the implications of the different amounts of temperature increases are explored.
Kristina	Perrin	Under aeroallergens it does not explain the history it only assumes the readers knows the history. It also does not cite or reference any source.	Ch 3: Air Quality		94	30	The reviewer's comment is not altogether clear. We have added an additional reference. See Ziska and Beggs JACI, 2012.
Minh	Doan	<p>This chapter thoroughly discusses the impact of climate changes on our food supplies and it explores known knowledge about the impact from drought and floods. It was a bonus that it was written in a very easily understandable language and organized beautifully with good referencing.</p> <p>I believe it is crucial for everyone to read up on this chapter in particular because I've found a lot of perspectives I have not thought of before. For example, the possibility of contamination during heavy rains and the chances of more bacterial growth as the weather heats up and harbors these illnesses. Furthermore, it slows down the shipments of food, increases the likelihood of food spoilage.</p>	Ch 6: Food Safety				We greatly appreciate your positive comment. We hope that you find the content useful.

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		We know that chemical is food for our foods and we try to stray away from food that has been sprayed with pesticide. Yet, I don't believe that we fully understand that there are other aspects of food contamination and how it's possible to help prevent this by helping to decrease activities that negatively affect our environment where our food is growing. This article does a very good job at drawing readers' attention to all the key facts.					
Ivette	Arias	If there is no clear explanation on how pesticide residue can have long term health consequences by consuming them, how can we predict the increased exposure to pesticides could have implications on human health?	Ch 6: Food Safety		219	30	<p>No specific predictions of health impacts were made due to the uncertainty noted by the commenter. Though the authors are confident that there are potential implications to human health from pesticide exposure, these implications will be specific to the kind of pesticide, the extent of the exposure, genetic predisposition, access to health care, etc. This has been clarified at the beginning of the section on Climate Impacts on Chemical Contaminants and also in the traceable accounts. Consequently, the chapter focused on broad trends in regard to pesticide impacts on human health. We refer those interested in a more detailed explanation to the provided citations in the chapter.</p> <p>See the Traceable Accounts section for Key Finding 2 for more details on uncertainty.</p>
Ryan	Jense	<p>Dear Document Committee,</p> <p>I would first like to thank you for this high-level document. It is of utmost importance that we continue to investigate and respond to the changing climate - especially as it pertains to Health.</p> <p>While I understand that this document was not intended to report on the underlying causes of human-related climate change, I would</p>					<p>We greatly appreciate your positive comment. The physical scientific basis behind climate change and the anthropogenic influence on recent climate change, as well as descriptions of sources of CO2, is discussed in the third National Climate Assessment (NCA3). However, there is a summary of observed and projected impacts in the Introduction chapter. The assessment does not include detailed discussions of climate mitigation, adaptation, or economic valuation.</p>

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		<p>none-the-less find it useful to have 1-2 early pages dedicated to the major culprits of this change. Perhaps this could be broken down by economic sectors and then also represented geographically by energy consumption/contribution of CO2 into the environment. It seems this would be useful towards creating the potential underlying solutions. In a sense, this is the "preventative medicine" component of the problem.</p> <p>Regards,</p> <p>Ryan J. Jense, MD</p> <p>University of Washington</p> <p>Department of Global Health</p>					
Ryan	Jense	<p>Dear Document Committee,</p> <p>I would first like to thank you for this high-level document. It is of utmost importance that we continue to investigate and respond to the changing climate - especially as it pertains to Health.</p> <p>While I understand that this document was not intended to report on the underlying causes of human-related climate change, I would none-the-less find it useful to have 1-2 early pages dedicated to the major culprits of this change. Perhaps this could be broken down by economic sectors and then also represented geographically by energy consumption/contribution of CO2 into the environment. It seems this would be useful towards creating the potential</p>					<p>We greatly appreciate your positive comment. The physical scientific basis behind climate change and the anthropogenic influence on recent climate change, as well as descriptions of sources of CO2, is discussed in the third National Climate Assessment (NCA3). However, there is a summary of observed and projected impacts in the Introduction chapter. The assessment does not include detailed discussions of climate mitigation, adaptation, or economic valuation.</p>

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		<p>underlying solutions. In a sense, this is the "preventative medicine" component of the problem.</p> <p>Regards,</p> <p>Ryan J. Jense, MD</p> <p>University of Washington</p> <p>Department of Global Health</p>					
Margot	Prior	Another source of stress relates to the lack of action to mitigate CC threats by people in power to do so. Individuals and communities feel helpless, frustrated, and despairing when their governments fail to provide leadership needed to bring about changes in the way we live which could safeguard the future.	Ch 8: Mental Health		301	6	Thank you for your comment. Due to the size of the topic, we focused on broad trends rather than delving too deeply or providing such a level of specificity.
Dojin	Ryu	<p>As summarized in the draft, it would be plausible to identify aflatoxin as a major threat in food supply under climate variability. However, other mycotoxins including patulin, ochratoxin A, and deoxynivalenol should also be included as they are equally affected by the global climate change.</p> <p>For instance, changing temperature, rainfall, and/or availability of ground water (for irrigation) may add stress to apples, wheat, and other crops to result in increased fungal infestation and subsequent toxin production. It is particularly true for ochratoxin A as it is produced by the fungi in two distinctively different genera, i.e. Aspergillus and Penicillium, in a wide range of environmental conditions. Thus, this possible human carcinogen (Group 2B) is known to occur in an exceptionally wide variety of agricultural commodities including fruits and dried fruits, all major cereal</p>	Ch 6: Food Safety		215	31	The chapter focused on broad trends for the topic with a more general audience in mind; additional details regarding specific mycotoxin or aflatoxin species biology can be found in the provided citations in the text. The impact of changing temperature, rainfall, and/or availability of ground water (including instances of drought) on crop stress, subsequent fungal growth, increase in toxin production over a wide range of crops, and health impacts (including cancer) is already discussed in the section on mycotoxins with additional information in the text box on mycotoxins The statement regarding survival of fungi at high temperatures has been removed, and the authors thank the commenter for this comment.

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		<p>grains, coffee, cocoa, nuts, and spices before harvest as well as during storage.</p> <p>In addition, I do not agree with the statement “However as temperatures continue to increase, they may reach a point too high for certain molds to grow or produce mycotoxins, thus reducing human exposure” referenced to Paterson and Lima (2010) on p. 216 (lines 2-4). While there is a range of temperature for a given fungi to produce toxins, the temperature on earth is not likely to stay above the limit particularly when considering the cultivation and storage period of any agricultural commodities. In other words, as long as the crop is present (grown and/or stored), toxigenic fungi will be able to survive, grow, and produce toxins under natural conditions.</p>					
Justin	G.	This chapter seems rather urban-centric or extensively geared towards the major US metropolitan regions. I advise adding material about rural or micropolitan communities since they will be impacted by climate change as well and may not reside near major hospitals.	Ch 2: Temperature-Related Impacts				The urban focus is representative of the emphasis in the epidemiological literature and consistent with the challenges of conducting statistical analyses in rural areas where deaths are less frequent so the baseline, for modeling purposes, is less stable. Text addressing the challenges and some emerging results from rural areas has been added to Section 2.10.
Justin	G.	Unclear whether the first sentence of Key Finding 2 ("Days that are hotter than normal in the summer...") has been true in the past (due to climate variability), under the current situation where the impacts of climate change have begun to be felt, or in the future when impacts get even more significant. Any adjustment in wording should also be incorporated into the first instance of this finding, on pp. 51.	Ch 2: Temperature-Related Impacts		67	28	Some updates to the text have been made.
Justin	G.	Regarding the first sentence in Section 2.2: do the authors mean "average daily temperature," "daily average temperature," or daily maximum and minimum temperatures? Do daily Tmax and Tmin values. What about relative humidity? Even though the temperature is geared toward heat, perhaps a clause just mentioning that relative humidity is considered separately may be helpful.	Ch 2: Temperature-Related Impacts		51	29	The author team believes the meaning of the sentence is clear without reference to a specific temperature measure. The impact of humidity in the perception of temperature is discussed specifically in Section 2.4. No change has been made to the text.

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Justin	G.	It may be interesting to mention whether the identifications and attribution to heat-related and cold-related deaths are determined immediately or after a lag of time. As someone who is not a member of the health community, I wonder whether such attribution needs to be made immediately (e.g. must mortality from a cold-related event occur immediately?) Until how late after the temperature event are mortality statistics tabulated and how are they managed?	Ch 2: Temperature-Related Impacts		53	32	Space constraints and relative priorities prevent a more in depth exploration and discussion of the issues raised in this comment beyond the text currently within Section 2.5. No change has been made to the text.
Justin	G.	Just curious: are we referring to temperatures in the shade or to temperatures outside? Also, are we referring to the central-cities, temperatures in portions of which are exacerbated by the urban heat island?	Ch 2: Temperature-Related Impacts		55	9	The text has been modified to clarify distinctions between the temperatures measured at weather stations and those experienced by individuals.
Justin	G.	What is "normal?" Does it refer to conditions prior to the onset of climate change given that climate change invokes a new normal climatic regime? See Milly et al. 2006 "Stationarity is Dead." The term "normal" therefore should be clarified. Also, "normal" has a very specific strong statistical meaning (i.e. 30-year climate "normals."). Is "normal" meant to imply that?	Ch 2: Temperature-Related Impacts		57	8	The text has been updated to clarify the meaning of "normal."
Justin	G.	When emergency room visits are discussed, are you also referring to urgent care centers which are proliferating across the country? Is there a spike in visits to primary care doctors during heat or cold waves? If there are, it would be interesting to factor those in to the discussion of ER visits here.	Ch 2: Temperature-Related Impacts		58	1	We found no literature that examined the morbidity impacts of extreme heat in terms of specific changes in visits to or use of urgent care centers. No change has been made to the text.
Justin	G.	Are you referring to the central-cities themselves or the metropolitan areas?	Ch 2: Temperature-Related Impacts		59	19	The author team has determined that the definition of "city" differs depending on the study in question, and does not need to be precisely defined in this sentence. No change has been made to the text.
Justin	G.	Please confirm that Lin et al. 2012 and Li et al. 2013 are the sources for the sentence about kidney stones. Otherwise, a citation is needed for that sentence.	Ch 2: Temperature-Related Impacts		59	32	Lin et al. and Li et al. are sources for the sentence about hospital admissions. The 3 kidney stone sentences are followed by citations to Brikowski and Fakheri. No change has been made to the text.
Justin	G.	The connection between kidney stones and climate is still not convincing. The idea of increased temperatures -> increased sweat	Ch 2: Temperature-Related Impacts		59	32	The text has been revised to address this comment.

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		-> kidney stones still seems overly simplistic. Besides, sweat is also governed by relative humidity.	ure-Related Impacts				
Justin	G.	I suggest rephrasing this sentence as it reads awkwardly and seems grammatically incorrect.	Ch 2: Temperature-Related Impacts		60	15	The text has been revised to address this comment.
Justin	G.	It would be better if this section would be more robust to account for various complexities. For instance, why are High School Football players especially vulnerable to heat illness? Is it because of the intensity of their practices and games, duration, or both? Is proper hydration always provided? Could it be that players overwork themselves in order to not appear "wimpy?" That happens a lot in high school games. Also, the issue of football players is not restricted to high-schoolers, the case of Korey Stringer who was an NFL player is one such example. My point is that as written, the aforementioned text seems rather simplistic given the many factors at play. Have other studies been done about this?	Ch 2: Temperature-Related Impacts		62	31	While the issue of high school football players and associated complexities of heat vulnerability are important, space limitations prevent us from addressing this topic in greater depth given the range of topics to be addressed. No change has been made to the text.
Justin	G.	For which spatial scale do the generalizations and statistics presented in this paragraph hold? Does it apply on the scale of the city or on the scale of the entire US? If it's the latter, to what extent is the effect geographically variable?	Ch 2: Temperature-Related Impacts		63	16	Most of the references for this paragraph discuss findings on city or neighborhood scales. No change has been made to the text.
Justin	G.	Perhaps a mention of why workman's comp or safety laws are insufficient in this regard could be interesting.	Ch 2: Temperature-Related Impacts		63	38	Addressing this topic is not within the scope of this report given space constraints. No change has been made to the text.
Justin	G.	The topic of relating climate change to violence is still being debated extensively in the literature. Yes, there is that classic article stating that baseball pitchers hit batters more during hot days than cooler ones but many have critiqued that work. The	Ch 2: Temperature-Related Impacts		64	18	The author team has determined that the sentence is properly cited, caveated, and included in an emerging issues section. No change has been made to the text.

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		paragraph reads as if the matter is closed, even though it says "may lead."					
Justin	G.	Does this sentence imply that a statistical sensitivity or elasticity exists (e.g. per degree deviation, something occurs to X%, or that something is X% more likely per degree deviation...)? If so, it would be neat if you could state the nature of it.	Ch 2: Temperature-Related Impacts		69	4	Different studies use different approaches to determine the relationship between temperature and mortality, and in those cases where there is linearity, it may be a result of the method, and not a finding of the study. No change has been made to the text.
Justin	G.	Add "urgent care" to ER/hospital visits?	Ch 2: Temperature-Related Impacts	2.1	82		For simplicity the text has not been revised as the author team determined that the current text currently adequately conveys the point.
Justin	G.	Please clarify how "Chicago" is defined. Clearly Chicagoland exceeds the extents of Cook County, but the county contains more than Chicago. I'm splitting hairs but I recommend rephrasing the title to something akin to "During the 1995 Cook County (Chicago and Vicinity) heat wave."	Ch 2: Temperature-Related Impacts	2	83		The 465 deaths are clearly referenced to Cook County so clarifying text has been added. This heatwave affected large portions of the Midwest but is commonly referred to as the Chicago heat wave, Because this figure comes from U.S. EPA directly, its title has not been altered.
Justin	G.	Please state which study documents the 209 US cities examined.	Ch 2: Temperature-Related Impacts	4	85		The author team believes the existing reference for the source of the figure as Schwartz et al., 2014 clarifies what the appropriate underlying study is defining these cities.
Justin	G.	Could the values presented be normalized by population in order to account for the range in the population of the cities? Are the values presented largely a function of a couple US cities with very dense populations? Clearly this isn't supposed to be a statistical work, but I nonetheless can't help but ask these when looking at the figure. Perhaps just the addition of one more sentence to the caption can be beneficial since not everyone is going to read the Schwartz et al. 2014 article.	Ch 2: Temperature-Related Impacts	4	85		Figure 4 presents a cumulative result across the cities with no change in population over time so there is no need to normalize the results.
Bruce	Snyder	Overall excellent report. Some thoughts: when I lecture on Climate Change and Public Health I begin with an acknowledgement that the fundamental problem is fossil fuel combustion that not only generates Climate Change but also generates massive amounts of					We greatly appreciate your positive comment about our report and hope that you find the content useful. The assessment does not include detailed discussions of climate

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		<p>highly toxic air and water pollutants (ie mercury, NOX, SOX, etc.). This sets the stage for discussing for example the connection between widespread fresh water mercury contamination (largely from coal plants), elevated maternal and infant blood Hg levels, and the implications for cognitive impairment (see for example Placental DNA Methylation Related to Both Infant Toenail Mercury and Adverse Neurobehavioral Outcomes. Jennifer Z.J. Maccani, Devin C. Koestler, Barry Lester, et al . 2014. http://dx.doi.org/10.1289/ehp.1408561).</p> <p>Additionally fossil fuel combustion generates numerous toxic volatile organic compounds that affect development - see for example : Perera FP, Chang H-w, Tang D, Roen EL, Herbstman J, et al. (2014) Early-Life Exposure to Polycyclic Aromatic Hydrocarbons and ADHD Behavior Problems. PLoS ONE 9(11): e111670. doi:10.1371/journal.pone.0111670</p> <p>Another issue is quantitation of risk. Granted ozone exposure worsens cardiovascular disease but how does the magnitude of risk compare to that of another major risk factor, say hypertension? When I discuss this with physicians this type of comparison can put Climate/Pollution in context. I haven't found numbers for this.</p> <p>Finally, this report deserves broader public attention to try and motivate a broad public awareness of climate as a priority. I hope you have been working on this aspect.</p> <p>Thanks for the good work of your group.</p>					<p>mitigation, nor the co-benefits of mitigation. The entire report has been reviewed and revised to ensure that where the underlying literature support it, we give an appropriate sense of the severity of impacts observed or expected. The report will be communicated to reach the public, as well as many public health, city planning, and other government officials as possible. There are other reports that cover these topics in more detail.</p>

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		Bruce D. Snyder, MD FAAN					
Marvin S.	Robinson, II	<p>" We, can not simply continue to wait, time keeps ticking the world is in constant motion, we haven't another MOMENT to WASTE"-quoted from one of my Consultants-CONSULTANT: before he crossed over to the side of life's Twin Mirror, when he was 91 years old.'</p> <p>IMPACTS of CLIMATE CHANGE on HUMAN HEALTH has been studied, lectured about with distinguished scholarly scientific evidence with opposite POSITIONS from equally brilliant highly educated professionals.</p> <p>However, the proof is in the reality of the MISERY Index all across the nation: we simply can not continue to be great global super star country in economics, education, innovation, arts, culture, media, Human Rights-</p> <p>With albatross around our NECKS, with CLIMATE CHANGE destroying our HUMAN HEALTH futures, Humanity of tomorrow will ask why did we turn our nations future into a sick demented HORROR FILM- into REALITY ?</p> <p>THIS is the MOMENT to take and siege EVERY available action to step beyond our boundaries to grasp better HORIZONS for FUTURE American populations, yet UNBORN.</p> <p>THERE is no PRICE too, HIGH- to risk SUSTAINABILITY over the immediate fixtures of neither GREED, nor IGNORANCE.</p> <p>This is the moment for the E.P.A. and the U.S. Global Change Research Program to step uP to the PLATE and knock the ball out of the PARK and HIT a HOME RUN for JUSTICE for the Future inhabitants to appreciate the flavor of just being HUMAN: and they WILL not appreciate, nor RESPECT those in there REALITY if we continue the current trends and paths of just DESTROY and PROFIT, no matter what. WE owe the FUTURE, we owe and are OBLIGATED to CONSCIENCE of Humanity: the ingredient that we still have a little bit left inside each of us, simple;</p>					We greatly appreciate your positive comment about our report and hope that you find the content useful.

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		"KINDNESS". IMPACTS on CLIMATE CHANGE on HUMAN HEALTH in the United States, anything I try to communicate- there is someone / somewhere with a rebuttal with big time degrees and more sophistication. But it doesn't take a rocket scientist to know, that we are all just here for a little while and so why not be as GREAT as, we can be, TOGETHER ? Thank you- "We haven't another moment to waste". Marvin S. Robinson, II QUINDARO RUINS / Underground Railroad- Exercise 2015					
Justin	G.	Please clarify the meaning of "tend to." That language doesn't seem very definitive.	Ch 3: Air Quality		88	3	After consideration of this point, we still believe the existing text is clear and accurate.
Justin	G.	I'm a little confused. Aren't changes in climate, rising temperatures, and altered precipitation patterns responses to increased atmospheric CO2? If so, why are these explicitly called out; it seems rather redundant?	Ch 3: Air Quality		88	10	In addition to climate, CO2 can directly influence aeroallergen production.
Justin	G.	The "will" seems a little out of place given the previous sentence uses the present-perfect tense.	Ch 3: Air Quality		88	18	We incorporated this edit
Justin	G.	Please clarify "the amount of energy used," as I don't understand its meaning given its context.	Ch 3: Air Quality		88	29	We incorporated this edit.
Justin	G.	Do these studies also discuss visits to Urgent Care centers?	Ch 3: Air Quality		92	5	These studies generally include emergency departments, but not urgent care centers
Justin	G.	"and on how" reads a little awkwardly to me.	Ch 3: Air Quality		101	15	After consideration of this point, we still feel the existing text is clear and accurate
Justin	G.	Please explain how each region is defined given that they are not called out in the text, and not everyone will go to Fann et al. 2014. Also, I think the top text should be placed in the space for the caption. Finally, what does each vertical line represent? I've only seen such lines used in boxplots with inner and outer fences.	Ch 3: Air Quality	3	119		We revised the figure title to clarify the number of regions in which we reported estimates. We modified the caption to clarify the meaning of the vertical lines.

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Justin	G.	Is the value over NW Oklahoma -0.3 or 0.3? I ask because the location of the - sign coincides almost exactly with the northern border of the Texas Panhandle. As such, I recommend moving that text a little higher.	Ch 3: Air Quality	4	120		We believe the existing figure is both clear and accurate.
Justin	G.	Please clarify the meaning of "minimum temperature." Do you mean "daily minimum temperature" or another timescale?	Ch 4: Vectorborne Diseases		129	5	Due to the size of the topic, and the page limit for the chapter, the authors focused on broad trends rather than delving too deeply or providing such a level of specificity. References are provided for the curious reader to elucidate the time scale. Generally, these were monthly or seasonal measures of minimum temperature.
Justin	G.	Do you mean "maximum daily temperatures" or another timescale when stating "maximum temperatures also significantly affect?"	Ch 4: Vectorborne Diseases		129	14	Due to the size of the topic, and the page limit for the chapter, the authors focused on broad trends rather than delving too deeply or providing such a level of specificity. References are provided for detailed follow up, however, these are generally monthly or seasonal measures of maximum temperature.
Justin	G.	I advise adding a "last accessed" date or "date viewed" since this map may change over time.	Ch 4: Vectorborne Diseases		145	38	This chapter's references are standardized based on the format for the report and generated by the EndNote database used for the report.
Justin	G.	What does <Go to ISI> mean?	Ch 4: Vectorborne Diseases		146	6	All of the references in the final report will be standardized to ensure consistency throughout the report.
Justin	G.	Suggest adding a "date accessed" term since the contents of the page referred to in this entry may change.	Ch 4: Vectorborne Diseases		151	13	This chapter's references are standardized to ensure consistency throughout the report and generated by the EndNote database used for the report
Justin	G.	Suggest adding a "date accessed" term since the contents of the page referred to in this entry may change.	Ch 4: Vectorborne Diseases		154	7	This chapter's references are standardized to ensure consistency throughout the report and generated by the EndNote database used for the report
Justin	G.	Is the clustering of black dots in the Megapolitan NE Corridor a function of population (i.e. as an extremely high proportion of the US population lives in that corridor, there would be more cases of	Ch 4: Vectorbo	2	156		The interpretation is correct. The map shows the distribution of reported cases and is not adjusted for population. After consideration of

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		lyme disease just based on chance alone)? Ditto with Chicagoland and the Minneapolis. Could we normalize these stats by population?	rne Diseases				the comment, we feel that the map is accurate for the context of this report.
Justin	G.	It might be helpful to add the words "by county or parrish" in the caption.	Ch 4: Vectorborne Diseases	5	159		The text has been revised to incorporate this suggestion.
Justin	G.	This is interesting but it would be interesting to present more material on non-coastal areas since water-related illnesses aren't confined to the coasts or Great Lakes areas. Reservoirs add miles of shoreline to the US, and water grids and septic tanks could also play a role. While the authors mention these, the chapter seems to overly emphasize coastal areas and the Great Lakes at the expense of most of the rest of the US.	Ch 5: Water-Related Illness				The chapter as a whole does not solely focus on coastal issues; there are detailed discussions of freshwater recreational impacts and drinking water impacts, for example. Where supported by the literature for climate change impacts in the US, text has been added to provide more detail on non-coastal areas.
Justin	G.	Please state the source for these statements.	Ch 5: Water-Related Illness		167	1	The text has been revised to incorporate this suggestion.
Justin	G.	Would it be helpful to mention CAFOs in this paragraph, or would that be out of scope?	Ch 5: Water-Related Illness		167	7	The Hribar 2010 citation discusses CAFOs. Due to the size of the topic, and the page limit for the chapter, we focused on broad trends rather than delving too deeply or providing such a level of specificity. We refer those interested in a deeper treatment of the topic to the provided citations. No change has been made to the text.
Justin	G.	I believe it would be excellent if you could mention that such concerns have driven the development of new rural water systems and the construction of water grids on tribal lands. Some examples include the Eastern New Mexico Rural Water System, and new systems in Montana and North and South Dakota.	Ch 5: Water-Related Illness		168	2	Due to the size of the topic, and the page limit for the chapter, we focused on broad trends rather than delving too deeply or providing such a level of specificity. No change has been made to the text.
Justin	G.	I believe it would be excellent if you could mention that such concerns have driven the development of new rural water systems and the construction of water grids on tribal lands. Some examples include the Eastern New Mexico Rural Water System, and new systems in Montana and North and South Dakota.	Ch 5: Water-Related Illness		168	2	Due to the size of the topic, and the page limit for the chapter, we focused on broad trends rather than delving too deeply or providing such a level of specificity. No change has been made to the text.
Justin	G.	I believe it would be excellent if you could mention that such concerns have driven the development of new rural water systems	Ch 5: Water-		168	2	Due to the size of the topic, and the page limit for the chapter, we focused on broad trends

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		and the construction of water grids on tribal lands. Some examples include the Eastern New Mexico Rural Water System, and new systems in Montana and North and South Dakota.	Related Illness				rather than delving too deeply or providing such a level of specificity. No change has been made to the text.
Justin	G.	I'd connect the discussion on pp. 168, lines 13-27, with the contents of this box given its the same city even though the material described differs.	Ch 5: Water-Related Illness		170	3	We have revised the text as suggested, emphasizing that the city is representative of issues that impact the Great Lakes region. We also added a cross-reference to the case study in the Exposure Pathways section.
Justin	G.	I suggest citing some numbers from the NRC or from EPA quantifying exactly how many aging water infrastructure systems are at risk of not being bale to completely control waterborne diseases or which are in bad repair.	Ch 5: Water-Related Illness		169	24	We have revised the text in section 5.4.1 to include additional detail regarding the ~50,000 community drinking water systems that have pipes that will reach their expect lifespan within 30 years.
Justin	G.	This chapter contains numerous locations for mention of the Gulf of Mexico Dead Zone. Given the scope of research concerning it and its relative fame, I believe it's worth mentioning. Also, would it be possible to invoke the issue of eating seafood from areas impacted by the Gulf of Mexico Oil Spill? Would that seafood contain higher risks of carcinogens or poison? Did the temperatures of the Gulf play any role in the extent of the Oil Spill? I don't know the answers and am therefore using this opportunity to ask.	Ch 5: Water-Related Illness				We appreciate the suggestion related to the hypoxia in the northern Gulf of Mexico, but space is limited and the amount of literature on human health impacts in the U.S. from hypoxic dead zones and their connection to climate change is sparse or nonexistent. The author team has deliberated and agreed on the most important information and illustrations to include. The points related to Deepwater Horizon Oil Spill that the comment raises are beyond the scope of this chapter/report. Thus, no change has been made to the text.
Justin	G.	The time period stated is "the 1990s." Therefore, did this integration overlap with the Crytospridium outbreak? If so, it might be helpful to explicitly state that so that a reader won't need to go back a couple pages to contextualize the dates.	Ch 5: Water-Related Illness		170	3	The text has been revised to clarify that the year completed was 1993, but this year is only coincidentally the same as with the Milwaukee Cryptosporidium outbreak and the work was not done in response to the outbreak. We have clarified that the original source of the Cryptosporidium was not definitively shown to be sewage overflows or upstream runoff.
Justin	G.	To be consistent with the entries for the other journal articles, I recommend adding the DOI, which is: 10.1016/j.dsr2.2013.09.018	Ch 5: Water-Related Illness		185	5	The text has been revised to incorporate this suggestion.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
Justin	G.	Need an "s" after "Disease" in the journal title (see article).	Ch 5: Water-Related Illness		187	12	The text has been revised to incorporate this suggestion.
Justin	G.	Recommend a "last cited" or "date accessed" given the contents of the cited webpages may change during the course of the year.	Ch 5: Water-Related Illness		188	32	The text has been revised to incorporate this suggestion.
Justin	G.	The doi, 10.1378/chest.06-1830 should be listed. Also, the article's webpage indicates a date of 2007 in-lieu of 2006. Which is correct? http://dx.doi.org/10.1378/chest.06-1830	Ch 5: Water-Related Illness		189	11	The text has been revised to double-check and complete the citation.
Justin	G.	DOI is missing. Please see http://dx.doi.org/10.1016/j.hal.2010.08.006	Ch 5: Water-Related Illness		189	14	The text has been revised to complete the citation.
Justin	G.	Incomplete bibliographic entry.	Ch 5: Water-Related Illness		199	11	The text has been revised to complete the citation.
Justin	G.	Unlike other chapters, many references in the bibliography cite both the doi and the URL. The bibliographies in most other chapters just cite the doi and only include a URL if a doi does not exist. Either way, I suggest standardizing a uniform practice across the report.	Ch 5: Water-Related Illness				The references have been standardized and edited in the final report.
Justin	G.	This figure has multiple issues. From seeing the pixalation of their respective pieces of text, I conclude that three of the four panels do not seem to be high-resolution images. The text in these maps is therefore very hard to read. Only high-resolution images should be included in this report given its importance.	Ch 5: Water-Related Illness	3	204		We thank the reviewer for the helpful suggestion, which has been incorporated into the figure.

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		Bottom right panel ("Projected Increases..."): which years does the figure illustrate? Also, I recommend using the same projection as the other three panels since it looks a little strange otherwise. Regardless, the projection used for this panel needs to be changed since the US-Canada outline is not a straight line. The projection use for the other 3 panels is right-on.					
Justin	G.	This figure is very hard to read if one doesn't have access to a color printer. I suggest revising the legend accordingly.	Ch 5: Water-Related Illness	4	205		We thank the reviewer for the helpful suggestion, which has been incorporated into the figure.
Justin	G.	This figure is very hard to read if one doesn't have access to a color printer. I suggest revising the legend accordingly.	Ch 5: Water-Related Illness	5	206		We thank the reviewer for the helpful suggestion, which has been incorporated into the figure.
Justin	G.	Please clarify the meaning of the first few words of the sentence. Do you mean the rate of growth of Virbio increases?	Ch 5: Water-Related Illness	5	206		Yes, this clarification has been incorporated into the figure caption.
Justin	G.	This figure is very hard to read if one doesn't have access to a color printer. I suggest revising the legend accordingly.	Ch 5: Water-Related Illness	6	207		We thank the reviewer for the helpful suggestion, which has been incorporated into the figure.
Justin	G.	This figure is very hard to read if one doesn't have access to a color printer. I suggest revising the legend accordingly. Also, a non-scientist may not understand the units used in the vertical axis.	Ch 5: Water-Related Illness	7	208		We thank the reviewer for the helpful suggestion, which has been incorporated into the figure.
Justin	G.	Are fertilizers relevant to this chapter? If so, could you add some discussion for it?	Ch 6: Food Safety				The comment is appreciated, but beyond the scope of this chapter. No changes have been made to the text.
Justin	G.	Does climate change provide any benefits to food safety, nutrition, and distribution? Could anything good come out of it?	Ch 6: Food Safety				The chapter does note that there are potential food production benefits from changes in winter temperatures and the timing of spring/fall or length of overall growing season. While the entire report does include an

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							assessment of any health benefits associated with climate change (noted in the Front Matter), there is not enough literature to support evidence that climate change will provide many benefits in terms of food safety, nutrition, or distribution. Benefits from CO2 fertilization on food production is outside the scope of this chapter, as this topic is covered by the USDA Food Security Report. The chapter text has been revised to note that in some cases, it is not clear whether the impact of climate change on a pathogen will be positive or negative (for example, drought can reduce water quality, increase runoff, and increase pathogen concentration, but can also decrease the survivability of certain foodborne pathogens.
Justin	G.	Could you please provide a source for the first clause on line 29 ("Although the United States...world,")?	Ch 6: Food Safety		212	29	The text has been revised (citation added) to incorporate this suggestion.
Justin	G.	Interesting discussion, but doesn't the US have safeguards against these or at least to mitigate them? If so, how much should we worry? A sentence saying that "we can't safeguard against 100% of foodborne illnesses..." would be useful here.	Ch 6: Food Safety		213	18	The issue of safeguards is addressed in the introductory paragraphs of the section on Food Safety of this chapter and has been added to the Key Findings and traceable accounts to provide better context regarding adaptive capacity.
Justin	G.	I see that Hurricane Katrina is mentioned; should the Exxon Valdez Oil Spill or the Gulf of Mexico be mentioned also for completeness?	Ch 6: Food Safety		218	18	The examples suggested by the commenter are not relevant to the chapter topic or the report's focus on the human health impacts of climate change.
Justin	G.	I believe it would be helpful to add a clause stating for which concentration of CO2 we are on track as a society, in order to contextualize the numbers provided in this paragraph.	Ch 6: Food Safety		221	6	The text has been revised for clarity and a reference has been provided to the Appendix 1: Technical Support Document, which provides more information on RCPs and projected concentrations.
Justin	G.	Arsenic is also a naturally-occurring element in various soils and a little < 10 years ago, new EPA standards resulted in various wells being taken off line in the Midwest and Southwest as a result. It would be helpful to integrate the fact that arsenic is naturally occurring within this description.	Ch 6: Food Safety		225	1	The text has been revised to incorporate this suggestion.

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Justin	G.	Suggest adding a "last accessed" date since the contents of that web page may change.	Ch 6: Food Safety		231	10	The references have been revised to incorporate this suggestion. All references will use a standardized format per USGCRP guidelines in the final report.
Justin	G.	I believe there is an extra "p" or "pp." in this entry.	Ch 6: Food Safety		235	39	Text has been revised.
Justin	G.	Suggest adding a "last accessed" date since the contents of that page are likely to change.	Ch 6: Food Safety		239	13	The references have been revised to incorporate this suggestion. All references will use a standardized format per USGCRP guidelines in the final report.
Justin	G.	The doi, which is 10.1371/journal.pone.0098546 is missing.	Ch 6: Food Safety		242	32	The references have been revised to incorporate this suggestion. All references will use a standardized format per USGCRP guidelines in the final report.
Justin	G.	Suggest adding a "last accessed" date since these records are sometimes revised and are usually always updated.	Ch 6: Food Safety		243	3	The references have been revised to incorporate this suggestion. All references will use a standardized format per USGCRP guidelines in the final report.
Justin	G.	Would it be possible to truncate the caption by adding material to the axes of the graphs? For instance, I notice the vertical axes lack units, and a better title can provide some of the caption's info as well.	Ch 6: Food Safety	3	247		We appreciate the suggestion; however, the complexity of the figure and limited space preclude adding additional detail. The detail in the caption and the figure title, which was determined by chapter authors as well as the authors of the underlying papers cited, is designed to fit to formatting guidelines for this assessment. All figures have been revised to meet formatting and graphic design to improve clarity in the final report.
Justin	G.	Could "ppm" in the top box be placed within parentheses?	Ch 6: Food Safety	4	248		Suggestion has been incorporated.
Justin	G.	Please explain the meaning of "Data are Summarized?"	Ch 6: Food Safety	4	248		Sentence has been revised for clarity.
Justin	G.	suggest concluding the sentence with a "due to" clause, such as heat, illnesses, etc.	Ch 1: Preface and		24	21	Thank you for your comment. Due to spatial limitations for this chapter and this report, we do not feel it is valuable or a good use of space

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			Introduction				to list all of the factors associated with health risks; therefore, the text has not been altered.
Justin	G.	"what we are used to" is grammatically incorrect.	Ch 1: Preface and Introduction		25	13	Thank you for your comment and concern; however, it is standard English usage to end a sentence with a preposition, and this assessment strives to maintain an accessible reading language, so the text has not been changed.
Justin	G.	Do you mean changes in climate and changes in climate variability, or changes in climate as well as the fact of life that is climate variability? Also, what do you mean by changes in weather extremes? Are you referring to intensity, frequency, pattern changes, or pervasiveness? Do the authors consider monsoons and the annual (pre-Aswan Dam) Nile flood to be extremes? I bring these up because those impact human health as well, even without climate change. It might be useful to assert that health is a function of weather even without climate change, and climate change will just make it worse.	Ch 1: Preface and Introduction		25	12	Thank you for your comment. The authors believe the commenter's questions and concerns are addressed by subsequent paragraphs in section 1.2 in the chapter so the text in this section has not been altered. Please also see the chapter on Extremes and the glossary (in the final report) for more definitions.
Justin	G.	What do "Average U.S. precipitation" and temperature mean? Over which timescale (e.g. annual precipitation?) Is this just CONUS? Which spatial scales? I bring this up because not everyone will go back to the NCA3 to get the details.	Ch 1: Preface and Introduction		26	8	The timescale and the geographic scale have been clarified, based on direct quotes from the 2014 National Climate Assessment (NCA3) Report Findings and the NCA3 Chapter 2 Key messages, as cited. Because this assessment relies on the findings of the NCA as its climate science basis, the authors have determined that it is appropriate to directly quote this source and that the level of detail is appropriate for a high level summary of impacts in the introductory chapter.
Justin	G.	Please explain what you mean by "persistent." The literature is ripe with examples of Megadroughts that were more severe and long-lasting than several in the 1900s. I advise reviewing the work of Connie Woodhouse at the University of Arizona.	Ch 1: Preface and Introduction		26	18	The text has been revised to clarify the period of record spanning from 1895 to present. There is no additional or specific definition for the word "persistent" beyond the typical dictionary definition, and as such this word has not been defined or added to the glossary. No change has been made to the citation.
Justin	G.	Are these trends linear, quadratic, exponential, etc.?	Ch 1: Preface and		26	36	The trends are scenarios describing potential concentration trajectories and are not simple mathematical extrapolations. The text has been

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			Introduction				revised for clarity. For more information, please see the technical support document (appendix) or the third NCA.
Justin	G.	I recommend calling out the types of severe weather since some relationships have not been determined. The bottom of Pp. 14 of the overview of the Third National Climate Assessment states "Other trends in severe storms, including the intensity and frequency of tornadoes, hail, and damaging thunderstorm winds, are uncertain and are being studied intensely."	Ch 1: Preface and Introduction		28	15	The authors disagree because of space constraints. The paragraph goes on to talk about hurricanes and heat waves, which are changing. For more specific information on projections of severe weather types, please see section 1.1 of this chapter, the chapter on Extreme Events, or the 2014 NCA.
Justin	G.	The Third National Climate Assessment indicates that some portions of the US, i.e. the Southeast, has cooled. It would be helpful to discuss that and the health impacts thereof in this chapter.	Ch 2: Temperature-Related Impacts				The text has been edited to discuss the data on trends in temperature and observed mortality in the US.
Justin	G.	It would be interesting to note to what extent the "Hiatus" impacts human health given the slowdown in temperature increase. Are there any studies that look into it? (More of a topic for the whole report but this review and comments site doesn't have an option to comment on the entire report).	Ch 2: Temperature-Related Impacts				The physical scientific basis behind climate change is discussed in the third National Climate Assessment (NCA3). This report focuses on the health impacts of the observed and projected climate change described in the NCA3. The text in the Temperature-Related Deaths and Illness chapter has been edited to discuss the data on trends in temperature and observed mortality in the US.
Justin	G.	This chapter heavily discusses demographics. In that spirit, is there anything that could be said about rural vs. urban populations?	Ch 1: Preface and Introduction				In general, there is not a great deal of published literature on the vulnerability of rural populations for climate change related health effects. Research on rural populations often focuses on specific populations more likely found in rural areas such as farmers, indigenous populations, agriculture workers, etc. Where the research supports mention of these groups they are included in the chapters relevant to the health topic (e.g. the chapter on Extreme Temperatures, the chapter on Mental Health, and the chapter on Populations of Concern). While the authors did not feel the amount of evidence on rural vulnerability required changes to be made to the introduction

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							chapter, changes have been made to the chapters on Populations of Concern to acknowledge the potential vulnerabilities of rural populations and the need for research to better characterize rural vulnerability.
Justin	G.	I don't see an entry for "Ohio Department of Natural Resources" in the bibliography even though it's cited as a source for this figure.	Ch 5: Water-Related Illness	3	204		We thank the reviewer for the helpful comment; the missing reference has been added to the References section of the chapter.
Justin	G.	The formatting of these entries seems to differ from the other entries for articles in this chapter. The first letter of the words of the titles are capitalized whereas they are usually lowercase except for the first.	Ch 5: Water-Related Illness		199	27	The formatting of the text has been revised for consistency.
Erick	Garcia	Key finding number 2 has into account the slow climactic impact on people who do not have the immediate means of solving such climate changes. However, people who are well off economically can also suffer from climate change since they can only go so far economically to defend themselves from the imminent climate change. And no matter how much money the rich pay to defend their homes against floods or any immediate catastrophe, insurance companies and their money will not be able to get back the life that they had before, thus bringing them stress, depression and later on mental illness. The issue of climate change and catastrophes affects everyone, and the fact that the rich are less affected than the poor (people, countries, etc.) is not acceptable and immoral. Climate change affects some more than others, but in the long run it will affect everyone. The key finding is pretty much stating that rich people do not have mental illnesses caused by climate change, which is not true. Now that the rich can do more to solve the issues of climate change to improve the lives of the rest, that is a possibility, however, when disaster strikes, we are all affected, climate does not discriminate. To make a claim that only those groups of people will be affected is biased. Eventually if we do not learn as humanity to adapt to the changing environment, mental illness will be our natural selection because we will be forced to survive under different conditions than what our bodies can handle.	Ch 8: Mental Health		312	11	We thank you for your comment. Key finding number 2 is focused on highlighting specific populations that are of concern but does not imply that others within the general population, including those with more financial means will not be impacted. Key finding number one includes everyone. We do have a section on resilience and recovery which provides some information on what helps some people fare better. The assessment does not include detailed discussions of climate adaptation. Consideration of human adaptive capacity has been included as appropriate to assess projected climate impacts on human health.

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		<p>Please provide more evidence as to how rich people will be less likely to develop mental illness, and why climate change is less likely to affect them, because A/C and polarized windows cannot protect the rich at all times. Katrina affected everyone who lived there, rich and poor, and they all developed mental illnesses, due to huge loses, lack of safety and support from the government. Such extreme weather caused other places in the nation to fear for their lives, as the rich began to spend in levees and the poor relocated to non-flood locations. It caused mass hysteria on housing at the coast, as insurance prices rose and people were relocated. The same happened in hurricane Sandy in 2012, where people in New York decided to displace from the beaches and therefore feared to go back there for months after the storm was over.</p> <p>http://www.bbc.co.uk/climate/policies/rich_poor.shtml - Information on how rich countries deal with problems and how poor countries are portrayed as the only victims.</p>					
Erick	Garcia	<p>The paper on Mental Health seems to pull data from hurricanes and floods only. Earthquakes have been known to hit the West United States and the Eastern United States recently. Earthquakes create fear of being trapped by building rubble and falling through sinkholes down faults. The paper only seems to mention limited information on extreme weather conditions and their impacts on mental health. I would like them to add that it is important as well to incorporate earthquake victims, as they are a good number of the population and causes mental issues just as bad as hurricanes and floods. A good example from these effects are from the TV show George Lopez shown at Nick @ nite. The show shows the possible phobias and mental issues that may surface from a major climate condition such as an earthquake. This connects to our doing, since we are drilling holes under the earth and creating pressurized zones that cause the rocks to displace. Earthquakes also cause tsunamis which are a well-known climactic phenomenon.</p> <p>http://www.imdb.com/title/tt0587236/ - George Lopez episode "Sabes Quake"</p>	Ch 8: Mental Health		296	32	<p>We agree that earthquakes and tsunami can create serious mental health consequences, however, the report addresses climate change impacts and earthquakes and tsunami do not fit within that scope. The climate change trends addressed in the report are indicated in Chapter 1.</p>

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Andy	Zen	<p>Global climate change may be the cause of increased extreme weather events that result in an increase of mental health issues across the nation. In general, the rise in global temperature results in an increase in the rates of the earth's hydrological cycle resulting in increased rainfall in certain regions and severe droughts in other regions which builds up into flooding as well as heat waves in the respective regions. In addition, increased amounts of natural disasters also result in stress which can affect mental health. Prolonged exposure to these conditions result in a variety of mental health issues. The Global Change Research Program can include these additional information in their report.</p> <p>The gradual increase in global temperature results in a more frequent occurrence of heat waves across the country which can have adverse effects on mental health. During heat waves, the population may suffer heat strokes which may lead to . . . neuropsychiatric syndromes with symptoms such as altered consciousness, agitation, restlessness, unconsciousness, and even death. The resulting mental health issues from the first heat wave also makes the population more susceptible to being affected by future heat waves, such that prolonged exposure to heat waves result in continued damage to the population's mental health. Study shows that more stress hormones are released into the blood due to excessive exposure to heat" which results in more violent aggression such that increasing rates of assault, rape, robbery, burglary, and larceny can be observed. Various other stress related behavior can also be linked to heat waves such as increased alcohol consumption and rates of suicide as a way to cope with higher temperatures. All of these effects are due to higher temperatures worldwide.</p> <p>In addition to heat waves, extreme weather events have generally resulted in large destructions of population and properties due to the severe increase in rainfall, resulting in floods and hurricanes which cover large amounts of land with heavy rainfall and wind. The resulting loss of property, family and the displacement of people can be attributed to the increased number of mental health issues such as post-traumatic stress disorder in the population. A study shows that the psychological distress, loss, and displacement resulting from weather related violent conflict have been found to</p>	Ch 8: Mental Health		296	25	<p>We thank you for your thoughtful comments. Due to the size of the topic, and the page limit for the chapter, we focused on broad trends rather than delving too deeply or providing such a level of specificity.</p>

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		<p>be associated with a wide range of mental health impacts including anxiety, depression, and PTSD. After a natural disaster, the lack of available resources may be the cause of these mental health issues over time as well as the lack of treatment. The existing service for mental health treatment is spread out over the increased number of patients and cannot cover everyone.</p> <p>As a result of the increasing global temperature, the treatment of mental health has to be taken into serious consideration over the coming years. The Global Change Research Program should provide information as to the amount of individuals affected by these events and how it affects the rest of the population.</p>					
Andy	Zen	<p>The Global Change Research Program report mentions the possible effects of climate change on children and certain individuals as it relates to their mental health. Here are some more information that expands upon this topic.</p> <p>On the subject of children, the climate change affects them directly as their generation will be the ones who experience the changes and the effects in its entirety throughout their life time. Studies have shown that children are known to show much more severe distress after disasters than do adults, and they are especially prone to predisaster anxiety and post-trauma illness. Prolonged exposure to the image of a desolate future can have adverse effects on their mental health particularly with symptoms of depression. The global climate change can be attributed to an increasing number of natural disasters as well as extreme weather events such as heat waves which have adverse effects on children. A research concluded that a quarter of the children who participated believe that the world will come to an end before they get older. As the future generation grow up, they may display an increase in cases of depression as well as PTSD as they are exposed to extreme weather events. The children have to be educated to understand the effects of climate change and how the world will adapt to the changes in contrast to their constantly exposure to the media's portrayal of the future in order to promote better mental health.</p> <p>Certain individuals have been shown to be more affected by climate change in their mental health than others. A study reports that if the individual is a female, or of under 35 years of age, and if</p>	Ch 8: Mental Health		302	29	Due to the size of the topic, and the page limit for the chapter, we focused on broad trends rather than delving too deeply or providing such a level of specificity. We thank you for your thoughtful comments.

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		<p>the individual has a ‘pro-environmental orientation’ and is high on ‘future anxiety’, they may be more susceptible to climate change. When confronted with reports of climate change, these individuals are shown to either become depressed or deny the existence of climate change. When exposed to society, they may experience feelings of hopelessness and frustration. If the affected are unemployed or poor, a study shows that these individuals run greater psychosocial risks of loss of personal freedom, have more negative perceptions about self, and may have feelings of stress, insecurity, and seclusion due to their lack of resources in avoiding extreme weather as well as recovering after an extreme weather event. Extreme weather events and disasters can cause a potential rise in suicide as a way for those individuals to escape their situation.</p> <p>When considering these factors, the Global Change Research Program should therefore consider providing data on the risk factors associated with different individuals as well as how it affects the rest of the population. Proper analysis of these risk factors can result in better diagnosis and treatment for the individuals who might be affected by climate change in the near future.</p>					
Danny	Varela	<p>The report recalls that human-caused climate change has caused an increase in Ozone pollution in the United States. However, it’s important to note that U.S. policies have help reduced ground-level ozone pollution. Throughout the report there is almost no reference to the fact that ground-level ozone has been reduced in the nation. It gives the reader the sensation that these levels are extremely high, and it might provide the wrong impression to some in the audience. The United States did have a rise on Ozone levels from the industrial revolution up to the 1980s. However, there has been a significant reduction in these levels. The EPA reports that ozone pollution has decreased about 33% between 1980 and 2013. In 1980, the concentration mean was around .10 ppm; today the mean of ground-level ozone is located right under the national standard of 0.075ppm. (EPA) An example of such reduction can be appreciated in Los Angeles- Long Beach-Santa Ana, CA, which all three are considered ones of the most polluted cities in the United States. Their exceedance of Days 8-hr Ozone Daily Max > 0.075ppm in 2003 reached about 114 days, but in 2014 only 67</p>	Ch 3: Air Quality		89	24	<p>Thank you for your comment, however policy issues are beyond the defined scope of the Climate and Health Assessment, a scientific document that provides the basis for decision making, but does not address policy.</p>

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		<p>days were reported unhealthy for sensitivity groups. (EPA) These statistics reflect the improvements that have been achieved in terms of ozone levels throughout the country.</p> <p>Through this report is important to emphasize to society that the policies that the government has adopted in the past decades, such as the Clean Air Act, have indeed reduced significantly various contaminants. Volatile Organic Compounds (VOCs) and Nitrous Oxides (NOx), which are the particles that produce ozone, have been reduced in the different regions of the nation, especially in Southeast. (Simon et al). Despite of the decrease of the precursors of Ozone, it's always important to remark that further reduction of these particles is imperative. Reducing these particles could help offset a possible increase of ground-level ozone formation due climate change (high temperatures, cloud cover, humidity, etc) in the future. In summary, it is recommended that the report mention that ozone levels have been reduced in order to provide a more accurate and updated report as to what has been done regarding ozone levels.</p> <p>Supporting Evidence for this Comment:</p> <p>EPA. "National Trends in Ozone Levels." Ground-level Ozone Air Trends. N.p., 2013. Web. 27 Apr. 2015. <http://www.epa.gov/airtrends/ozone.html#oznat>.</p> <p>EPA. "National Ambient Air Quality Standards (NAAQS)." N.p., 2014. Web. 27 Apr. 2015. <http://www.epa.gov/air/criteria.html>.</p> <p>Simon, Heather, Adam Reff, Benjamin Wells, Jia Xing, and Neil Frank. "Ozone Trends Across the United States over a Period of Decreasing NOx and VOC Emissions." Environmental Science & Technology (2014): 186-95. Web. 2 May 2015. <http://pubs.acs.org/doi/full/10.1021/es504514z>.</p> <p>EPA. "Ozone Exceedances." Web. 2 May 2015. <http://www.epa.gov/airquality/airdata/ad_viz_ozcompare.html>.</p>					

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Danny	Varela	<p>The report states that climate driven conditions will increase ozone levels, and that it would lead to premature deaths, hospital visits, loss of school days, etc. I believe that in order to have a greater impact on the audience and a better assessment, more evidence is required regarding the effects of a possible increase in ground-level ozone and its relation to health issues. An example of such missing piece of evidence is the Wyoming Department of Health report on Ozone Exposure. The research aimed to find a relation between the number of visits by people with respiratory problems and the ground-level ozone exposure during that period of time. The research was conducted in Sublette County, which counted with two monitoring stations that recorded the level of ozone between January 1st, 2008 and December 31, 2011. Through this time period approximately 14,529 case-days related to respiratory problems were registered at the local clinic. After analyzing the data, the Department of Health concluded that there was a 3% increase in the number of clinic visits for respiratory problems, the day after the stations recorded a high ground-level ozone concentration. Doing further research on the direct relation between ground-level ozone and different health issues is highly recommend in order to create more awareness on how future increase in ground-level ozone will affect the U.S. society's health and productivity.</p> <p>Additionally, I think that the report is missing a crucial element on its assessment of human health. Ground-level Ozone also has had a major impact in vegetation in the past years. Reporting on the impact that this pollutant has on major crops like soybean and wheat is also a topic to consider when assessing its impact on human health. In the 1990's, an interesting study done in the Southern Appalachian Mountains found that Black Cherries reduced their growth by about a 10%, when exposed to certain ozone levels several hours per day.(National Park Services) This analysis reflects the fact that ozone tends to affect the plant's ability of producing and storing food. Providing and doing further research on the impacts of ozone on vegetation is extremely important, as it correlates directly to our health. If ozone is to increase in the future, not will it only affect our respiratory</p>	Ch 3: Air Quality		93	3	After considering this comment we believe the existing text is adequate. The risks to human health from exposure to ground-level ozone are described and cited within the report. Because this chapter assesses the human health risks attributable to climate change, we do not consider impacts to vegetation.

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		<p>systems, but it might also affect the quantity and quality of our crops, ultimately affecting our well-being.</p> <p>Supporting evidence for this comment:</p> <p>Forslund, Thomas. "Associations of Short-Term Exposure to Ozone and Respiratory Outpatient Clinic Visits." Wyoming Health Department, 1 Mar. 2013. Web. 27 Apr. 2015. <http://www.health.wyo.gov/phsd/ehl/index.html>.</p> <p>EPA. "Ecosystems Effects." 1 Nov. 2012. Web. 2 May 2015. <http://www.epa.gov/groundlevelozone/ecosystem.html>.</p> <p>National Park Services. "Overview of Ozone Effects on Vegetation." Web. 3 May 2015. <http://www.nature.nps.gov/air/aqbasics/docs/epaozoneresponse.pdf>.</p>					
Aamir	Ali	<p>On page 177, in section 5.5, the report lists the populations of concerns. I agree that it's important to analyze the effects of increased water contamination on the populations listed: children, pregnant women, Alaskans, and people of the northwest United States. However, I believe that we must also take into consideration the increased effect that climate change might have on water contamination on people of lower socioeconomic status, and I want more information to be provided on this issue.</p> <p>There is a clear connection between people of low socioeconomic standing and the neighborhoods in which they live, which is that they tend to live together in poor quality neighborhoods. And there is another correlation between these neighborhoods and the standards of their resources, water quality being one of them. This is discussed in an online article published by the United Nations. The findings were that these neighborhoods have lower quality drinking water, water delivery systems, and plumbing (Water and Cities). While these areas are increasingly gaining access to better sanitation and water quality, the amount of people residing in these neighborhoods is growing as well. If climate change is impacting bacterial and viral growth in water supplies, and there is traceable</p>	Ch 5: Water-Related Illness		177	18	The text has been revised to emphasize and better reflect the literature available for climate change impacts to low-income populations in the US, including those living in the U.S./Mexico border region.

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		<p>data for a rise in illnesses due to the increased growth, then this would not exclude the people who live in low socioeconomic neighborhoods. Furthermore, the very nature of having a low socioeconomic standing, these people will find it more difficult to recover from illnesses that they are at risk of getting from the contaminated water and resume their work. For this, I believe the assessment must take into consideration how much climate change is impacting these people's water quality. Because, if they are experiencing a higher than normal level of contamination, then they may be experiencing higher amounts of illness, possibly even deaths, related to the degradation of water quality.</p> <p>In addition to this request, the Encyclopedia of Earth claims that populations such as the urban homeless, migrant workers, and those living in colonias (settlements that appear near the U.S.-Mexico border) have no infrastructure to clean, quality assured water (Theobald). Without these resources, it's natural to expect these populations to turn to the nearest and most suitable sources for water they can find, i.e. untreated water. Perhaps looking into the amount of people of this nature who become ill from drinking subpar water might also be valuable. Although, the amount of data on a niche group of people may be insufficient, and research on people living in colonias will need to be conducted.</p> <p>Works Cited</p> <p>Theobald, Rebecca, Lisa Headington, and L. Westcoat. "Water and Poverty in the United States."</p> <p>Eoearth.org. National Council for Science and the Environment, 26 Feb. 2013. Web. 06 May 2015.</p> <p>"Water and Cities." UN News Center. United Nations, 24 Nov. 2014. Web. 06 May 2015.</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
Aamir	Ali	<p>I would like to see more data on section 5.3, which is the section of water-related contaminants. It states that “high amounts of rainfall and subsequent runoff can overwhelm the capacity of these systems,” which leads to “discharging raw sewage directly into surface waters”. There needs to be a more detailed explanation as to what overwhelming the capacity exactly means. For example, one could interpret “overwhelming the capacity” as a literal overflow of the storm water conveyance systems. However, another interpretation could be that the conveyance systems became backed up and the different types of water (rain and sewage) were mixed and contaminated as a result of the high amounts of rainfall. The assessment does not mention more than what’s been quoted and, within the data for municipal waste systems, may be some key findings to expand on the effects of climate change, which would provide more elaborate understanding of its effects on water contamination. In essence, providing examples and information of what sort of rainfall runoffs cause the capacity to be overwhelmed would be more helpful in understanding what is going on.</p> <p>Along with this, I would like to see data on how high rainfall amounts affect municipal waste systems’ capacity; for example, what sort of strain does the increased rainfall put on the system, and what about that strain is causing overflow? Information on the cities that experience this problem and level of illness that arises in those cities would also improve the assessment. Seeing which regions of the United States experiences this problem would allow for further research to be conducted more efficiently; it would allow potential studies to monitor the precise location, or general regions, where this is more of a concern. That way a clear trend can be analyzed based on the rainfall, city management of high rainfall, and illnesses arising due to the rainfall and its management. Going more in depth, as is proposed here, would establish an extra level of credibility. With the added research, the claim would be more readily accepted because, by delving into the data, the reader would find it difficult to deny the evidence. Perhaps providing a solution, a fix, that can circumvent the effects of climate change on these systems, however premature, can open the way to quicker action to better combat the effects of climate change. Such a proposed solution does not have to be infallible, as</p>	Ch 5: Water-Related Illness		166	31	<p>We have added data of rain amounts that result in combined sewage overflows to give the readers a better point of reference. We clarified the text in this section as concisely as possible due to page limitations and referred to the box in the following section (CSO case study), which was also revised to include benchmarks for amounts of rainfall. No epidemiology or modeling studies have been conducted to estimate illness; therefore, we focus on the increased exposure and risk for illness.</p>

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		it would be hypothetical, but with sound reasoning, it could, perhaps, lead us in the right direction.					
Jesus	De La Garza	<p>It is critical for the Global Research Program to focus on how climate changes our food supply, specifically with changes in timing and length of seasons.</p> <p>The impact of climate change on the food supply in the United States has several pathways. One pathway that has many contributors is that of seasonal changes with the change of temperatures and timing, with climate change, warm months carry on longer with an increase of temperature. The greatest impact from this is the geographic, seasonal, and magnitude in occurrence of the bacteria present in our food. This bacteria is responsible for foodborne illnesses that increase with temperature changes and other favorable climate changes. A deadlier one of the foodborne illnesses is salmonella, salmonella increases can be attributed to warmer conditions (The Lancet). More foodborne illnesses included in the report with increased temperatures are Campylobacter, Vibrio vulnificus, and Escherichia coli among others. More information regarding the role of climate change on the transmission to and development of food pathogens through animals should be of further focus in the proposed report. This is important because of the facility of contaminants to enter the food chain, starting with animals. A topic of this could be in elevated water temperatures that lead to higher concentrations of methylmercury, and the susceptibility of aquatic animals to absorb this. More important, the article could certainly give more information on the implications these contaminants have on human diet.</p> <p>Many infectious agents, vector organisms, non-human reservoir species, and rate of pathogen replication are sensitive to climatic conditions (The Lancet). In regions with warm weather salmonella and cholera disease are more prominent and proliferate more rapidly with increased temperatures. It is very crucial for the</p>	Ch 6: Food Safety		219	1	<p>Many of the topics suggested by the commenter are already covered within the chapter, including impacts on bacteria, foodborne illnesses, methylmercury, and some animal transmission pathways.</p> <p>We agree that the role of climate change on the transmission to and development of food pathogens through animals is important; however, due to the size of the topic and the page limit for the chapter, we focused on broad trends regarding pathogen transmission as provided in section 6.3.2.</p> <p>Impacts on the behavioral choices determining human diet, particularly as an adaptive response, or on economic impacts is beyond the scope of this chapter and report.</p>

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		<p>United States Global Change Research Program to further focus their attention on the implications of climate change to foodborne illnesses as it affects the health of everyone in the United States. The failure to do so could cause an epidemic in the health of our nation with following economic problems. The United States Global Change Research Program could start with giving more information on the effect of climate change on the direct and indirect transmission of infectious diseases between vectors and humans. Without the necessary information it is difficult for the public to see where the effects of climate change on health will go in the decades to come. The lacent and the proposed paper coincide in that both list the viruses and effects of climate change on foodborne illness.</p> <p>The Lacent. "Climate change and human health: present and future risks."</p> <p>Science Direct. Ed. Anthony J. McMichael. N.p., 17 Mar. 2006. Web. 1 May</p> <p>2015. <http://www.sciencedirect.com/science/article/pii/S0140673606680793>.</p>					
Jesus	De La Garza	<p>It is critical for the Global Change Research Program to focus explicitly on food safety, primarily the quality of food in the United States.</p> <p>Healthy and nutritious food is fundamental to good health. Production is highly dependent on climate; the variations of climate from precipitation, temperature, and extreme weather such as flooding are key components of food safety. The increase of atmospheric carbon dioxide due to climate change has direct effects on food crop quality, lowering nutrients and protein in grains and legumes such as wheat, rice, and soybeans. Wheat, in particular, provides nearly one-fourth of all global protein in the</p>	Ch 6: Food Safety		220	36	<p>The issue of rising CO2 and reduced protein content of certain crops is explicitly stated within the text. An overview is provided in section 6.3 and in the traceable accounts section.</p> <p>As noted in the introduction, impacts of climate change on food production or health outcomes associated with changes in food production are beyond the scope of this chapter. References have been provided with discussion of these topics elsewhere. A finding from the USDA Food Security Report has also been added to the introduction text to help highlight the importance of this topic while noting it is beyond the scope of this report.</p>

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		<p>global human diet (UC Davis 2014). It is clear that change in climate will negatively affect the quality of our food and therefore the health of everyone in the United States.</p> <p>Experimental field studies in the late 1990's on the response of wheat to different levels of atmospheric carbon dioxide have been examined by researchers from the University of California, Davis; the samples of wheat examined by the researchers had been grown in the Maricopa Agricultural Center near Phoenix, Arizona (UC Davis 2014). This coincides with the topic of the proposed report from USGCRP. What the report lacks is the demonstrated findings that increased levels of carbon dioxide inhibit plants' assimilation of nitrate into proteins. The processing of nitrogen of nitrogen plays a key role in the plant's growth and productivity (UC Davis 2014). As a result, when the decline is factored into perspective, it becomes clear that the overall amount of protein available for human consumption may drop by about three percent (UC Davis 2014). The reports coincide in the fact that it is expected that the reduction in nutritional value because of the increased carbon dioxide is expected to continue in the future. The USGCRP report does not give much on the reduced nutrition of minerals such as zinc, calcium, magnesium, and others although it is very likely to be reduced in most plants also as a result of rising carbon dioxide levels. There is no uncertainty that the effect of climate change will adversely affect the quality of the food in the United States; as professor Arnold Bloom from the Department of Plant Sciences in UC Davis says, "Food quality is declining under the rising levels of atmospheric carbon dioxide that we are experiencing," (CBSNews). Without careful consideration from the United States Global Change Research Program of these impacts on the quality of food, we will be ill prepared on the effects this will bring to the overall health of everyone in the US.</p> <p>"Field study shows why food quality will suffer with rising CO2." news.ucdavis.edu. N.p., 7 Apr. 2014. Web. 1 May 2015.</p>					<p>Due to the size of the topic, and the page limit for the chapter, we focused on broad trends rather than providing the level of specificity suggested by the commenter. The authors refer those interested in a deeper treatment of the topic to the provided citations.</p>

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		<p><http://news.ucdavis.edu/search/news_detail.lasso?id=10886>.</p> <p>"Food quality at risk if climate change continues, study says."</p> <p>http://www.cbsnews.com/. N.p., 8 Apr. 2014. Web. 6 May 2015.</p> <p><http://www.cbsnews.com/news/food-quality-at-risk-if-climate-change-continues-study-says/>.</p>					
Kristen	Schmorleitz	<p>It would be great if there could be an expansion on the implications of how climate change is expected to alter the distribution of vectorborne diseases. I realize that the document states when the height of these diseases occur during the year, but I think more specific examples would further demonstrate the intensity and importance of Lyme disease, especially on the "Projected Impacts," page 131, section 4.3.3, line 3.</p> <p>Additionally, as touched on in "Objectives" on page 131, section 4.3.4, line 27, if you could expand on as to why Lyme disease predominantly affects those in the eastern United States (i.e. how it arrives there), I believe it could help diminish the spread of the disease. If Lyme disease holds a position vital enough in order to concern the American public, then giving and explaining preventative measures to combat Lyme disease in the report would surely help those who can potentially be affected by the disease. The Center for Disease Control provides lots of information on how to prevent the illness ("Preventing"). I believe a section could be created for this idea entirely on its own and would further the lowering of disease rates.</p> <p>Finally, the graphs and pictures put in at the end of the document could be relocated to where they are mentioned in the actual text, increasing the reading efficiency for the reader. I find it much easier personally to be able to visualize the concept while I am</p>	Ch 4: Vectorborne Diseases		131		<p>The authors did not project changes in the distribution of Lyme disease under climate change scenarios because present-day linkages between climate and the geographic distribution of Lyme disease cases is poorly understood at this time.</p> <p>The text has been modified in the Populations of Concern section, as the authors feel this is the most appropriate place for a brief discussion of prevention activities that may reduce vulnerability to vectorborne diseases. A detailed discussion of VBD prevention goes beyond the scope of the chapter.</p> <p>Within the constraints of the graphic layout, authors attempted to put these figures and images as close to the relevant text as possible.</p>

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		<p>reading about it, rather than lose my place in the text I am reading to find the graph or picture that is being referred to.</p> <p>References</p> <p>"Preventing Tick Bites on People." Centers for Disease Control and Prevention. Centers for Disease Control and Prevention, 04 Mar. 2015. Web. 07 May 2015.</p> <p><http://www.cdc.gov/lyme/prev/on_people.html>.</p>					
Kristen	Schmorleitz	<p>The West Nile Virus section should highlight a case study from a different continent that has had the disease for a long time, such as Africa, where Morocco, Algeria, and Tunisia are all suffering from the virus (Benjelloun). I think this would make your case stronger – you could observe how it the virus has increased in hosts over time and compare it to the United States. I believe doing this could maybe assist in projecting possible future outcomes for the United States. It could also demonstrate the impact the disease has had on a particular nation and maybe help in future preventative measures.</p> <p>Furthermore, in “Projected Impacts” on page 136, section 4.4.3, expanding on the future projections for West Nile Virus would clarify the reader on how impacted the future may be by mosquitos. I realize there are citations for this section; however, since the paragraph starting at line 17 and ending at 23 states how the future projections could “possibly [result]” in an increase in mosquitos in some regions, clarification on how this could occur by providing evidence that “extreme heat” will increase, assisting in proving how the virus remains a viable and feasible concern for the American public. In addition, climate change is mentioned in “Populations of Concern,” page 136, section 4.5, first paragraph, but it lacks the explanation of what kind of climate change and how this is occurring impacts the effectiveness of the disease. Furthermore, I do think that explaining the factors that affect</p>	Ch 4: Vectorborne Diseases		136		<p>While this comment suggests a good, specific example of WNV in another country, the scope of this report is the US and the authors feel the existing examples are appropriate and adequate.</p> <p>Regarding the suggestion to expand the paragraph on long term projections: Due to the size of the topic, and the page limit for the chapter, the authors focused on broad trends rather than delving too deeply or providing such a level of specificity.</p> <p>The text in the Populations of Concern section addresses this comment by discussing climate change impacts to vector and disease seasonality and geographic distribution and by discussing the many factors that may play an important role in population vulnerability to vectorborne diseases.</p>

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		<p>vulnerability to vectorborne diseases is crucial in demonstrating the cause and can help people prepare for the oncoming of disease.</p> <p>References</p> <p>Benjelloun, A., M. El Harrak, and B. Belkadi. "West Nile Disease Epidemiology in North-West Africa: Bibliographical Review." National Center for Biotechnology Information. U.S. National Library of Medicine, 2015. Web. 07 May 2015.</p> <p><http://www.ncbi.nlm.nih.gov/pubmed/25753775>.</p>					
Kristen	Schmorleitz	<p>In section 4.8 on page 141, beginning at line 35 and ending at line 37, it states that non-climate factors also affect – in addition to climate change – disease occurrence. Examples that are listed of non-climate factors include age, gender, socioeconomic status, geography, and occupation. As I was reading these factors, I did not understand how they would affect the prevalence of vectorborne diseases in relation to Lyme disease or the West Nile Virus. It would help tremendously if the Program could quickly touch on how these factors can potentially contribute to the distribution of such diseases.</p>	Ch 4: Vectorborne Diseases		141		The text has been revised for clarity.
Michael	chislock	<p>Impacts of extreme events on human health</p> <p>(Chapter7.7 PG265 Line 24-27)</p> <p>As climate change effects on global weather continue to grow, the importance of the Global Change Research Program’s investigation on the potential risks associated with the rise of wildfires and its effects on our water supply is heightened. An estimated two-thirds of Americans get their fresh water from forest areas according to the Committee on Hydrolic Impacts of Forest Management. These water sources are some of the most important on the globe and with the growing concerns associated with droughts and water supply shortage, ensuring our water remains uncontaminated must be a top priority of our government.</p>	Ch 7: Extreme Events		265	24	We appreciate this suggestion. The text has been revised. We have also included the suggested citations.

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		<p>One of the most globally affected areas is North America's southwest, where droughts and strong winds have a tendency to create vast wildfires spanning over 100,000 acres (Smith171). Large fires have tremendous effects on soil erosion and produce substantial changes in run off generation and patterns. Ash beds produced by these fires have been linked to increased run off due to the ashes reduction of soil infiltration (Smith180). Following these fires, large rainstorms move vast amounts of ash and various other sediments and organic material into local rivers and streams. Although these topics are explained lightly in the report, there is significant room for research on the contamination potential from runoff directly from burned sites on downstream water supplies. It is crucial that the government encourages investigation into possible effects various substances could have on our water quality.</p> <p>A study in 2003 provided insight into wildfires potential for water contamination. Following one of the most severe fires in recorded history, located in south Alberta, Canada, scientists found highly variable water quality in areas directly discharged from burned sites following their research. Water sources marked increases in turbidity and elevated amounts of dissolved organic compounds (DOC). Research also concluded that an increased amount of heavy metals and other contaminants were found in water down stream from these burned sites(Emelko461). Overall, the study concluded that even with proper cleaning techniques it could take several years and possibly decades until these water supplies return to their previous levels.</p> <p>With the uncertainty regarding climate changes effects on wildfires and thus water quality, further study is vital to ensure these changes have minimal impacts. The current economic and technical issues associated with purifying discharged burn sites should be a main topic of examination. Expanding research to help facilitate more effective means of water treatment is essential. Failure to safeguard uncontaminated water sources could result in extensive health risks for Americans. Given the growing concern associated with climate change and the imminent increase of global</p>					

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		<p>wildfires, I urge the Global Change Research Program to examine the growing threat wildfires could have on our water supply.</p> <p>Smith, Hugh G., Gary J. Sheridan, Patrick N.j. Lane, Petter Nyman, and Shane Haydon. "Wildfire Effects on Water Quality in Forest Catchments: A Review with Implications for Water Supply." <i>Journal of Hydrology</i> 396.1-2 (2011): 170-92. Academic Search Complete. Web. 29 Apr. 2015.</p> <p>Emelko, Monica B., Uldis Silins, Kevin D. Bladon, and Micheal Stone. "Implications of Land Disturbance on Drinking Water Treatability in a Changing Climate: Demonstrating the Need for "source Water Supply and Protection" Strategies." <i>Water Research</i> 45.2 (2011): 461-72. Academic Search Complete. Web. 29 Apr. 2015.</p>					
Michael	chislock	<p>Impacts of extreme events on human health</p> <p>Studying the possible ramifications of climate change on coastal nuclear power plants is essential for the Global Change Research Program. Although the report identifies that climate change is a threat to various mechanical systems across the globe, it fails to address the possible effects climate change have on coastal nuclear power plants. With sea levels estimated to rise between one to two meters by 2100, the increased risks of coastal erosion and storm surges on nuclear power plants could have dramatic impacts on both local and global environments (Kopytko30). Further research is needed to help confirm that power plants are up to date and well equipped to deal with the varying weather patterns brought about by climate change.</p> <p>Nuclear powers plants' current dependence on cooling water and offsite electricity may prove devastating if safety systems were disabled or damaged in the wake of a natural disaster. Inaccessibility of sites through the destruction of roadways and other transport methods put into question the reliability of offsite</p>	Ch 7: Extreme Events		256	11	We appreciate this thoughtful comment. Due to the size of the topic, and the page limit for the chapter, we focused on broad trends rather than delving too deeply or providing such a level of specificity. The text has been revised to incorporate some aspects of this suggestion.

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		<p>supplies and electricity. Hurricane Andrew, in 1992, supplied examples of this inability to deliver essential supplies to nuclear sites in critical condition. Andrew struck the Turkey Point Nuclear Power Plant located just south of Miami. Communication ability was knocked out for over 24 hours, and the plant was unable to receive offsite electricity for over five days. Authorities were forced to transport fuel and supplies via helicopter due to the roadways being blocked by debris (Kopytko32). To help deal with the rising issues brought about by climate change, further research is needed to help facilitate the production of more reliable safety systems.</p> <p>Storms across the US are now becoming more difficult to predict and prepare for. Improving current safety systems are vital towards ensuring Americans health. Hurricanes have begun to more regularly strike areas that historically have only seen minor effects. More research is needed on the effects these growing storms could have on coastal erosion to ensure the future foundational stability of coastal nuclear power plants across the nation.</p> <p>California's coast has recently seen a sizable increase in large storms, which produce a significant threat to the nuclear site at San Onofre beach. This ocean front site is at direct risk of both ocean flooding and landslides (Kopytko35). Furthermore, the storage of onsite nuclear waste presents added potential for contamination. If events cut off essential supplies or damaged vital safety systems in the wake of a disaster, it could prove globally catastrophic.</p> <p>Further research is required to ensure safety and to better prepare for the likely effects these growing storms could have on costal nuclear power plants. Failure to recognize and prepare for these kinds of disasters could prove cataclysmic towards Americans' health. I support the Global Change Research Program to advance governmental intervention and the production of favorable policies to ensure that these nuclear sites are well equipped. The magnitude of damages that could potentially occur from the destruction of a nuclear power plant is verification that our government should insure that this topic is a top priority in the future. Further</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>investigation of potential risks associated with nuclear powers contamination is both a domestic and global necessity.</p> <p>Kopytko, Natalie."Uncertain Seas, Uncertain Future For Nuclear Power." Bulletin Of The Atomic Scientist 71.2 (2015): 29-38. Academic Search Complete. Web.29 Apr. 2015.</p>					
Maria	Barquero	<p>Although outbreaks of disease attributable to drinking water are not very common in the U.S., it is critical for the Global Change Research Program to focus on all the populations that could be affected by this, particularly in sensitive and immune-compromised populations. Due to the fact that water related illnesses can lead to serious acute, chronic, or sometimes fatal health consequences, it is important to consider the effects of climate change on all groups that could possibly be affected in the United States. From 1971 to 2002, there were 764 documented waterborne outbreaks associated with drinking water, resulting in 575,457 cases of illness and 79 deaths (Reynolds); however, the true impact of disease is estimated to be much higher. Chapter 5 section 5, focuses mainly on children who could be affected by this climate impact when in reality we are all at risk. As mentioned before, there should also be some extra focus on sensitive populations. This chapter is best positioned to consider vulnerable populations, but it is important for the USGCRP to describe the unique vulnerabilities to climate change health impacts associated with the following groups: communities of color, low income, immigrants, limited English proficiency groups, and indigenous people. More detailed statistics on each individual ethnic group or location of residence should be provided in order to show how different economical classes are affected and how it correlates with their eating habits, and exposure to untreated water. It is also crucial to consider that private water supplies are not regulated by the US Environmental Protection Agency and are generally not treated or monitored, although very few of the municipal systems involved in documented outbreaks exceeded the USEPA's total standard in the preceding 12 months (Reynolds). Water purification technologies applied at the point-of-use (POU) can be effective for limiting the effects of source water contamination, or deliberate post treatment acts.</p>	Ch 5: Water-Related Illness		177		<p>We appreciate the suggestion related to risk factors and populations of concern in the context of water-related illness, but space is limited. The chapter focused on broad trends for the topic that are relevant for the United States and are supported by the peer-reviewed, published literature. We have added some summary information about low income individuals and those with pre-existing medical conditions (for example, the immunocompromised) in the Populations of Concern section for this chapter. We refer those interested in a deeper treatment of the topics discussed in this chapter to the provided citations. The author team has deliberated and agreed on the most important information and illustrations to include. Many of the suggested diseases and statistics provided by the commenter are pertinent in a global rather than U.S. context and thus are not within the scope of this chapter. The text has been revised to better reflect the body of literature available for impacts to populations of concern within the US.</p>

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		<p>When it come to bodies of water around the country, any of the millions could infected with waterborne diseases due to the immense effect of climate change. This then would cause every citizen of the United States to be at risk because any person that could come in contact with it is at risk. It is important to point out that aquatic life could also become infected due to climate change. Fishing could become a way of acquiring one of these waterborne diseases such as arsenicosis, fluorosis, and guinea worm disease, among others. Inadequate drinking-water, sanitation and hygiene are estimated to cause 842,000 diarrheal disease deaths per year WHO 2014, and contribute substantially to the other diseases listed above (UNICEF). For these reasons, it should be noted in the USGCRP how all populations are at risk and focus on ways to solve this problem.</p> <p>Reynolds, KA. "Risk of Waterborne Illness in the United States." PUBMED. N.p., Sept. 2008. Web. 25 Apr. 2015.</p> <p>"Water, Sanitation, and Hygiene." UNICEF. N.p., 23 June 2015. Web. 28 Apr. 2015.</p>					
Maria	Barquero	<p>Chapter 6.3.1 is best positioned to consider the effects of climate change mainly on how it affects crops and agriculture as a whole. An important sector of the food supply in the United States is omitted on this chapter. It is crucial for the US Global Change Research Program to also focus on the impact climate change has on livestock and how it happens. Americans consume more than 37 million tons of meat annually. The U.S. livestock industry produced \$100 billion worth of goods in 2002 (Agriculture and Food Supply). The effects on livestock can be caused by both direct and indirect factors of climate change. Extreme heat, for example, affects animals both directly and indirectly. Heat waves cause stress on animals which can lead to reduce milk reduction, vulnerability to disease and reduction in fertility (The Effects of Climate Change on Livestock Production). This problem has led to the death of many animals which has reduced the amount of livestock available. Another way that climate change can affect livestock is by threatening pasture and feed supplies. This is caused by longer and intense droughts in some important areas. Drought therefore reduces the amount of quality forage available to grazing</p>	Ch 6: Food Safety		213		<p>As stated in the introduction section of this chapter, the scope of the chapter does not include the interactions of climate change on agricultural production (supply) or price, nor the health outcomes associated with changes in production or price. That topic has been covered elsewhere as noted by the references. A finding from the USDA Food Security Report has also been added to the introduction text to help highlight the importance of this topic while noting it is beyond the scope of this report.</p>

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		<p>livestock (The Effects of Climate Change on Livestock Production). Climate change may also increase the prevalence of diseases and parasites that affect livestock. The earlier onset of spring and warmer winters could allow some parasites and pathogens to survive more easily. In areas with increased rainfall, moisture-reliant pathogens could thrive (Agriculture and Food Supply). Any climate change effects on livestock directly affects food safety in the United States.</p> <p>Another sector omitted in this section of chapter 6 are fisheries. Many fisheries already face multiple stresses, including overfishing and water pollution. Climate change may worsen these stresses. In particular, temperature changes could lead to significant impacts. Some of these impacts include water warming. This changes in temperature and seasons can affect the timing of reproduction and migration of species. Also, some diseases that affect aquatic life become more prevalent in warm water. Changes in reproduction and aquatic animals carrying diseases can therefore affect the food supply and safety directly not only by a likely decrease on the amount of different species available, but also by affecting consumers of this fare. In addition to warming, the world's oceans are gradually becoming more acidic due to increases in atmospheric carbon dioxide. Increased acidity could harm shellfish and many other aquatic species. Acidification may also threaten the structures of sensitive ecosystems upon which some fish and shellfish rely. As a result, it is important for the US Global Change Research Program to focus on the other sectors mentioned above affected by climate change due to the direct effect it has with food safety.</p> <p>“Agriculture and Food Supply.” EPA. Environmental Protection Agency, 2012. Web. 30 Apr. 2015.</p> <p>“The Effects of Climate Change on Livestock Production – J.L. Hatfield of USDA’s Agricultural Service (ARS) Explains the influences if Climate on Livestock.” The Pig Site. N.p., 19 June 2008. Web. 01 May 2015.</p>					
Samuel	Petzold	<p>Author: Samuel Petzold</p> <p>Chapter: Chapter 7: Extreme Weather</p>	Ch 7: Extreme Events				After consideration of this point, we still feel the existing text sufficiently describes the

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		<p>Text Region: Section 7.7 Wildfire</p> <p>In section 7.7, paragraph 1, line 7, on Wildfires, the draft examines how the frequency of wildfires has been increasing over the years. The draft mentions the effect of the particulates and various health problems associated with such fire-related incidences. I assert it is conducive to the discussion and beneficial to people's understanding of global warming to examine more of the social effects, which affect quality of life and human health, of wildfires. An area notorious for drought, such as southern California is an example of a location that experiences many fires year round. It would seem important to tally the total of schools cancelled and school days missed due to "fire-days," when students are not required to go to class and include the costs of paying the school districts for remaining closed for those days or weeks. This is one example of the many direct and indirect effects of global warming. One could argue that these fires also contribute to asthma attacks but most of all is the opportunity cost of not being able to go outside and exercise while these fires occur to those that understand the respiratory risks. Many school sporting events occur after school and unless ash is raining from the sky, sporting events and practice are not cancelled. As mentioned in section 7.7, paragraph three, line 26, these pose great risk to respiratory illnesses. But even after the fires are put out, the particulates that linger in the air may affect people who now exercise outside not knowing there are still particulates in the air (Borenstein). This can exacerbate effects of respiratory disease and appear underestimated in the review of wildfires on human health. One article describes nearly thirty various schools closed over one wild fire in San Diego (Gazette). This has an immense social effect in the opportunity cost of not being able to go to school, which is important to mental health. I think it is important to know the cost of these wildfires with respect to immediate safety as well. There is also much property damage to infrastructure when fires occur; the after-effects of removing the surface vegetation also put many previously burned areas at risk for landslides. Additionally, there is a great cost of public services to taxpayers for firefighters and the extraction of water from drought-ridden areas where there is already a limitation of water. This may even give arsonists the</p>					<p>impacts of the event. No change has been made to the text.</p>

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		<p>opportunity to wreak havoc by intentionally starting an already fire-prone geographic location. These confounding variables should be more closely examined by the USGCRP.</p> <p>Works Cited</p> <p>Bell, Jesse E., Stephanie Herring, and Lesley Jantarasami. "Chapter 7: Extreme Weather." U.S. Global Change Research Program. United States of America, n.d. Web. 29 Apr. 2015.</p> <p>Borenstein, Seth. "Wildfires Worse Due to Man-Made Climate Change, Studies Show." Huffington Post. TheHuffingtonPost.com Inc, 19 May 2014. Web. 29 Apr. 2015.</p> <p>Gazette, Reno. "California Wildfire's Thick Smoke Closes School." USA Today. KXTV-Sacramento, 23 Sept. 2014. Web. 21 Apr. 2015.</p>					
Samuel	Petzold	<p>Author: Samuel Petzold</p> <p>Chapter: Chapter 7: Extreme Weather</p> <p>Text Region: 7.9 Emerging Issues</p> <p>One emerging issue of climate change is the rise of sea level in the future due to the melting of glacial and Antarctic ice, along with the expansion of sea water due to the warming of the climate (Rice). Both of these factors will contribute to sea level rise and has dire consequences to modern civilization. These issues at hand are difficult to quantify but deserve attention because 40% of the world's population, 2.8 billion people, lives near the shoreline (Rice). On the topic of health impacts of extreme weather,</p>	Ch 7: Extreme Events				<p>Due to the size of the topic, and the page limit for the chapter, we focused on broad trends supported by the peer-reviewed scientific literature. The specific points the comment raises are beyond the scope of the chapter, as the literature is not well established on this topic. No change has been made to the text.</p>

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		<p>specifically sea level rise, it would be useful to cite a certain period of time where sea level rise has impacted human health then speculate that there are many confounding variables. I believe this is a result of the time period between now and when coastal regions would seriously be affected by ocean rise. Line 1, paragraph 1, of section 7.5, "Flooding and Other Health Hazards Associated with Extreme Precipitation, Hurricanes, and Coastal Storms," gives some indication of sea level rise contributing to "nuisance flooding" but gives no examples or the sheer magnitude of what may happen when sea level rises another 1 to 4 feet by the year 2100 (Bell). This is only a footnote in Table 1 but deserves more attention. One example of this nuisance sea level rise would be Katrina as there is convincing evidence that global warming exacerbated the destruction of the city. 1,833 citizens perished and there was \$80 billion dollars in damage to the city; this death and damage could be reduced in future hurricanes if carbon emissions were directly confronted (Rice). These rising sea levels give fuel to more powerful storms as what happened in Hurricane Katrina. These coasts also contain the largest cities which are centers for economic activity, which is associated with people's well-being ("Sea Level").</p> <p>Short-term effects have been seemingly accounted for but it is the long-term ones that should be of great concern. Even a one to four foot raise in the ocean level will give the opportunity of storm surges to be powered up and override levees and land barriers. These barriers are the only thing standing between the storms and the population centers. It should be noted that sea level rises in the immediate vicinity of the storms surges so it will go even a few feet further. There is even evidence of how sea level rise contributes to disease because mosquitoes are more likely to thrive in these environments. West Nile Virus and Malaria, which are both transmitted by mosquitoes, are major killers and will threaten the United States with sea level rise (Philander). For these reasons and for reasons yet to be uncovered in future research, sea level rise deserves more attention from the USGCRP.</p> <p>Works Cited</p> <p>Bell, Jesse E., Stephanie Herring, and Lesley Jantarasami. "Chapter</p>					

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		<p>7: Extreme Weather." U.S. Global Change Research Program. United States of America, n.d. Web. 29 Apr. 2015.</p> <p>Philander, George. "Climate Change, Effects of." Encyclopedia of Global Warming & Climate Change." Vol. 1. N.p.: SAGE Reference, 2013. 271. Gale Virtual Reference Library. Web. 30 Apr. 2015.</p> <p>Rice, Doyle. "Study: Climate change to worsen hurricane storm surge." USA Today. KXTV-Sacramento, 18 March. 2013. Web. 21 Apr. 2015.</p> <p>"Sea Level." Climate Hot Map. Union of Concerned Scientists, 10 July 2011. Web. 26 Apr. 2015.</p>					
Tyffany	Hutchinson	<p>This short section touches on the mental health and wellbeing of indigenous populations, saying that more studies are needed. It is important for the United States Global Change Research Program to include more information on this particular topic because it pertains to a group of people not currently on the forefront of the majority of people's minds. By bringing attention to this group it would serve both this draft and the people well. There have been a couple studies into the effects of climate change on the mental health of indigenous populations and how their ties directly to the environment and the effect of climate change on the environment are having adverse effects on indigenous population's mental health. Looking the indigenous people in northern Australia, the article "'Radical Hope' and Rain: Climate Change and the Mental Health of Indigenous Residents of Northern Australia" by Ernest Hunter explores the idea that though indigenous residents have stood the test of time and managed to change with their environment, there is still risk to their mental health as their livelihood changes with the climate. Hunter touches on the fact that when compared to non-indigenous Australians, indigenous "...have higher rates of serious mental disorder..." (Hunter 448). This predisposition to mental health related disorders supports the environmental vulnerability faced by the indigenous when it comes</p>	Ch 8: Mental Health		308	22	<p>The authors appreciate the comment but space is limited and we are unable to expand on this topic. Indigenous people are discussed in the Populations of Concern and Emerging Issues sections of the chapter. This reference has been added:</p> <p>Ford, James D.. "Indigenous Health and Climate Change." □ American Journal of Public Health: July 2012, Vol. 102, No. 7, pp. 1260-1266. Web. 29 Apr. 2015.</p>

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		<p>to climate change. Though the article is focused on indigenous in Australia it is still relevant to our society because it shows how indigenous groups, because of their heavy reliance on the environment in which they live, have strong side effects when it comes to the changes developing due to climate change. The same problems faced by Australia's indigenous will be faced by our own indigenous groups who rely just as heavily on the environment as Australia's indigenous populations. Another article that could help in further the public's understanding of the mental health issues faced by indigenous populations is the article by James D. Ford titled "Indigenous Health and Climate Change" which looks at indigenous populations from all over the world. This article takes an important look at the gaps in understanding that indigenous populations face when it comes to climate change. Ford writes that "it is estimated that there are approximately 370 million indigenous people globally and at least 5000 distinct groups, with only a small fraction explicitly studied with regard to the health impacts of climate change" (Ford). It is important for societies to understand climate change and the effects it can have because this provides insight into how to react and plan accordingly to the coming changes, however without this knowledge indigenous groups are left vulnerable to the detrimental effects associated with climate change.</p> <p>References</p> <p>Ford, James D.. "Indigenous Health and Climate Change." American Journal of Public Health: July 2012, Vol. 102, No. 7, pp. 1260-1266. Web. 29 Apr. 2015.</p> <p>Hunter, Ernest. "'Radical Hope' and Rain: Climate Change and the Mental Health of Indigenous Residents of Northern Australia." Australasian Psychiatry 17.6 (2009): 445-52. Academic Search Complete. Web. 28 Apr. 2015.</p>					
Tyffany	Hutchinson	I believe that it is important for our society to view and understand the effects of climate change on the homeless populations because this is a group in need of a voice and whose lifestyle makes them incredibly vulnerable to the effects of climate change. More	Ch 8: Mental Health		306	3	We thank you for your comment and suggested additional references. However, due to space constraints we are unable to delve deeper into the topic.

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		<p>information on the effects of climate change on this group can be found in the article “Health of the Homeless and Climate Change” and more general information about the vulnerability of homeless can be found in the article, “Neighborhood Effects on Heat Deaths: Social and Environmental Predictors of Vulnerability in Maricopa County, Arizona.” Both articles focus on the vulnerability homeless face when it comes to environmental changes, especially those found to be caused by climate change. The first article looks at how mental illnesses are common in homeless and this leaves them susceptible to further stress caused by climate change. In the article they write that “Levels of mental illness such as depression and schizophrenia amongst the homeless are much higher than the general population” (Ramin). The article also goes into the multiple other already common problems related to homelessness that would be exacerbated by climate change including, “High rates of poorly controlled chronic disease, smoking, respiratory conditions, mental illness and exposure to extreme temperatures and vector populations render homeless populations vulnerable to new and resurgent disease processes associated with climate change” (Ramin). The second article focuses on the vulnerability faced by homeless in terms of their environmental vulnerability, and more specifically vulnerability to heat. The fact that the homeless have very limited ways in which to shelter themselves from the environment around them means they are more susceptible to any stress that arises from a changing, heating environment. Balbous and Malin write that “Living in poverty is a key individual risk factor for death related to heat because it decreases the odds of access to medical care and protective resources” (as cited in Harlan). By giving more information on homeless and the problems they face, I believe the more people will be able to understand and begin to help push to solve the problems the homeless face. Since it is difficult for homeless to voice their opinions and concerns it is up to those who have voices to take a stance for them. Understanding the mental health and vulnerability of the homeless population in America is the first step in protecting the homeless.</p>					

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		<p>References</p> <p>Harlan, Sharon L., et al. "Neighborhood Effects On Heat Deaths: Social And Environmental Predictors Of Vulnerability In Maricopa County, Arizona." <i>Environmental Health Perspectives</i> 121.2 (2013): 197-204. Academic Search Complete. Web. 30 Apr. 2015.</p> <p>Ramin, Brodie, and Tomislav Svoboda. "Health of the Homeless and Climate Change." <i>Journal of Urban Health : Bulletin of the New York Academy of Medicine</i> 86.4 (2009): 654–664. PMC. Web. 30 Apr. 2015.</p>					
Sid	Kincke	<p>"Highly destructive hurricanes", the authors explain- using Hurricane Katrina as a reference point- leave in their wake not just physical damage, but also have the potential to increase instances of clinically-high stress levels, PTSD, domestic disputes, and depression and suicide. Additionally, these hardships may be compounded by other circumstances specific to the individual in question, most notably previous and recurring experience with traumatic life events- as bolstered by a statistic stating that Katrina-displaced veterans with prior histories of psychological issues were almost seven times more likely than their non-diagnosed counterparts to display such symptoms. Other complications may extend outside of the individual, into the larger community in which he/she lives, as seen in survivors of the 2004 Florida hurricanes, whose instances of PTSD reportedly increased due to their perceptions of their neighbors as possessing a lack of community concern.</p> <p>When it pertains to actually evaluating the credibility of the information contained within this selected paragraph, on surface level, one might conclude that these arguments are credible and serve to logically advance the authors' position. All of the claims presented are followed by parenthetical citations referencing peer-reviewed studies, for instance. However, when one begins to evaluate beyond first impressions, and starts to actively discern how the facts presented might advance the argument in a logical fashion, one realizes improvements must be made in anticipation of the report's final publication.</p>	Ch 8: Mental Health		297	14	<p>We thank the reviewer for this in-depth and thoughtful comment. Regarding the specific reference to Florida, we have removed the specific reference to the state. Regarding hurricanes, Katrina research and other references included in the chapter do provide some additional hurricane references. These include the Lowe article about Hurricane Ike, and Lew & Wetli's article about mortalities related to Hurricane Andrew. However, it should be noted that a significant body of research was conducted post-Katrina resulting in its inclusion.</p> <p>Regarding the complexity of the cause of mental health issues following disaster: due to the size of the topic, and the page limit for the chapter, we focused on broad trends rather than delving too deeply or providing such a level of specificity. Regarding PTSD, the authors still feel the existing text is clear and accurate.</p>

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		<p>In discussing the psychological effects of so-called “highly destructive hurricanes”, the most glaring improvements to be made fall in the area of contextualization. More specifically, greater clarification must be made as to what exactly constitutes a “highly destructive hurricane”. The authors provide the all-still familiar example of Hurricane Katrina, but give no further explanation as to what exact circumstances may lead to catastrophic psychological outcomes in survivors. Are these hurricanes so impactful on the human mind because they are of a certain magnitude, or because they leave in their wake a certain amount of property damage or repair costs? Or, are these hurricanes so psychologically devastating because of circumstances already present in the individual patient at the time of the storm?</p> <p>This suggestion could also be extended to the next point of evidence offered, pertaining to the effects of hurricanes on those with prior trauma experiences. In illustrating this point, perhaps the authors could examine the mental health of those with significant trauma experience in the wake of a different hurricane, besides simply referencing Hurricane Katrina ad nauseam. It is understandable that it may serve some sense of continuity to examine Hurricane Katrina in multiple examples and arguments, but the illustration of hurricanes’ wider causation of mental illness would be better served by showing numerous instances of this occurrence, across time and in differing locales. While Katrina is no doubt etched in the public consciousness, utilizing it as being demonstrative of a larger psychological trend is a difficult proposition. When one examines its place in history as the “costliest U.S. hurricane on record”, its death toll approximating 1200 persons, and its storm surges of 25 to 28 feet in places, it is easy to see that Katrina is not a proper frame of reference if one wants to examine the effects of hurricanes as a general phenomenon (“Hurricanes in History”). For greater perspective, the average U.S. hurricane renders about \$1 billion in damages in comparison to Katrina’s \$145 billion (“How Much Does a Hurricane Cost?”), and U.S. hurricanes in the aggregate are only responsible for 17 deaths annually (McNeill). In addition, Katrina’s physical magnitude was combined with a variety of unique sociological and infrastructural considerations, namely the failing of New Orleans’ levees and the controversy regarding</p>					

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		<p>appropriate FEMA response. As a rule of thumb, it is dangerous to make generalized conclusions in reaction to extraordinary events; this case is no different, and it would be rather fatalistic to expect the average hurricane to engender mental responses of the same order as found in Katrina survivors.</p> <p>When the authors do in fact shift historical focus, towards the 2004 Florida Hurricanes, another issue arises. The assertion that PTSD levels increased in citizens who felt a certain civic detachment from their neighbors in the wake of such a disaster can attract criticism from numerous angles. Firstly, there may be a fallacy regarding correlation and causality. This statistic does not definitively demonstrate the role that hurricanes may indeed have in PTSD formation; rather, it may simply speak to a surveyed individual's personal reaction in the wake of a tragedy, inspired by their own tragic circumstances, and not to the power of the weather event itself. Moreover, recent studies have indicated that "[e]xperience of the stressors required for PTSD does not appear to be highly predictive of the development of PTSD symptoms; indeed, PTSD symptoms occur often without the confrontation of death or serious injury required for PTSD" (Armstrong and Olatunji). Also, the increased knowledge of PTSD in the public consciousness as of late may actually backfire when it comes to making accurate diagnoses of the disease. Soldiers and others who have experienced harrowing experiences "may be lead to confuse normal difficulty readjusting to civilian life with evidence of pathology" (Armstrong and Olatunji). Economic incentives have also been proven to lead certain individuals to falsely claim symptoms, in the hopes of receiving disability benefits from governmental sources (Armstrong and Olatunji). Confusion regarding PTSD has also extended its tentacles into the medical community, as there have been documented instances of medical professionals "confusing symptoms of depression or other anxiety disorders with PTSD" (Armstrong and Olatunji). The ambiguity surrounding PTSD, as it pertains to its causes and how best to diagnose the disease, is problematic to the report's credibility. In the best interest of fostering an accurate and credible report, I would recommend eliminating PTSD discussion at this time, unless more concrete evidence finds its way into the publication.</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
Sid	Kincke	<p>This section opens with a discussion of the general problems posed by drought. Drought is uniquely problematic, in that it is slow to develop, but, once developed, persists for a long time. Drought, the authors say, like many other ills, seems to combine with whatever other social or economic concerns may be ongoing in the lives of those unlucky enough to be subject to nature's wrath. They continue by explaining that drought's impacts are not only visually apparent, but can have economic ramifications and emotional effects on those involved in industries at the mercy of environs surrounding them, the sub-committee continues. More specifically, the authors discuss the current state of drought in U.S. affairs, claiming that drought's effects are not acknowledged as often as they should be, due to a chronic trend of underreporting the issue. Perhaps due to this trend of underreporting, the authors seek to use Australian examples to demonstrate the potential emotional effects of drought on society at-large.</p> <p>In examining the arguments posed by this section, the most prominent feature seems to be an overriding generality of argument. Broad claims are made, and focus shifts not only between individual and community level concerns, but even crosses transnational boundaries. Quite honestly, some of the framing of this section is not in line with the larger chapter discussing mental health and climate change. Economic and industrial ramifications are mentioned, which, while important in their own right, do not adequately illustrate climate's effects on mental health in the broader mission of the chapter.</p> <p>Again, it would be helpful to have greater context for this portion of the report. Namely, the most prominent example of this is when drought is described as an extreme weather pattern. Does this mean that drought, in and of itself, is extreme, or are the writers referring to a specifically severe and sustained category of drought? Additionally, would a drought engender increased negative mental health consequences given certain social and mental considerations of its victims? Are there any commonalities of mental health, family structure, or socioeconomic level which commonly contribute to a drought causing adverse mental health problems? Next, it would add a tremendous level of credibility if the authors could provide greater numerical demonstration, or at least a source</p>	Ch 8: Mental Health		298	20	<p>Thank you for your thoughtful and in depth comment. Regarding the complexity of the cause of mental health issues arising from drought, due to the size of the topic, and the page limit for the chapter, we focused on broad trends rather than delving too deeply or providing such a level of specificity. Regarding drought reporting, this text has been removed from the document pursuant to other comments. Regarding the contributing factors that may worsen drought-related mental health concerns, specific vulnerabilities or characteristics that may cause certain populations to be of higher concern are discussed in the populations of concern section of this chapter, as well as in the populations of concern chapter. Regarding predicting drought mental health impacts in the US based on Australian literature/experience, the authors still believe the text is clear and accurate as is. Regarding drought and extreme weather, the section has been changed so Drought is now its own section.</p>

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		<p>citation, to their claim that instances of drought related mental illness are underreported. This is a massive claim about the state not only of climate, but of the medical community at large, and deserves expansion if it is to remain in the final report. Finally, the discussion of Australia needs to be expanded. When one examines economic factors, the argument that Australian trends may eventually be paralleled in the U.S. is dealt a critical blow. Agriculture and agriculture-related industries constitute approximately 12 percent of Australia’s GDP (“Farm Facts”). In the U.S., agriculture’s role in economic affairs is much more subdued, with agriculture and its related industries only constituting 4.8% of U.S. GDP (“Ag and Food Sectors and the Economy”). From this statistic alone, one can see how much more Australians have invested in agriculture than their American counterparts. It is conceivable, therefore, that negative psychological reactions to drought are more widespread, if not more intense, in Australia than in the U.S. Going forward, it would not be advisable to utilize Australia experiences in predicting the effects of drought on mental health in the United States, unless the authors can demonstrate more concrete reasoning for using Australia as a point of comparison in this matter.</p>					
William	Kuhn	<p>In the introduction of the water-related illness section of the assessment (Ch. 5.2, p 163-166), there was not a compelling case of why the public should care about these water-borne pathogens. In today’s world of express liability, listing “gastrointestinal illness” amongst a list of possible symptoms of a bacteria in Table 1 does little for the reader, when even mild pharmaceuticals list far worse illnesses as side effects. Last April I was diagnosed with Salmonella and Giardia, two water-borne pathogens, in a small town in the Bolivian jungle. While I recovered with two rounds of antibiotics, at-risk groups like young children, the elderly, and individuals with auto-immune diseases are not so lucky. Even so, Salmonella and Giardia caused me to drop 20 pounds, have little to no energy, and put my travels on hold while antibiotics and imported Gatorade cleansed my body. It took about three days until I was functional, and six weeks to report no symptoms. Adding an anecdote like mine would make the entire introduction more persuasive.</p> <p>In addition, while the paper is on water safety in the United States,</p>	Ch 5: Water-Related Illness		163	1	<p>We appreciate this suggestion, but space is limited. The author team has deliberated and agreed on the most important information and illustrations to include. The introductory text has been revised in some places to emphasize the scale of what’s at stake while also reflecting the literature available for climate change impacts associated with water-related illness in the US.</p>

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>the global problem of water sanitation would make the reader respect the problem of water sanitation and appreciate and seek to protect the U.S. system and way of life. This additional paragraph could be included at the end of section 5.2 and before section 5.3 on page 166. Advances in water treatment are one of the great improvements of the 20th century in developed nations. However, in a 2002 Pacific Institute Research Report, between 76 million and 135 million people will die from water-borne pathogens between 2000 and 2020, the equivalent of five 9/11s every day for twenty years . Most of these deaths will occur in poorer countries without access to a treated water supply and adequate medical care, there are still 12-19 million people in the United States affected by water-borne diseases, as indicated on page 166 line 10. This statistic is the heart of what the introduction should be about. However, there are a few issues with that number. First, the number is almost ten years old and it does not explain the nature of “the effected.” The reader is left to hypothesize whether the effected had simple stomach aches and mild nausea or life-threatening gastrointestinal illness. In addition, doing a simple calculation to get an estimate of how that number could grow through climate change would be extremely beneficial to the reader to frame the meaning of chapter 5. It would also be an easily digestible figure that could be reproduced in online news articles and help spread awareness to climate change and water-related illness.</p>					
William	Kuhn	<p>A key finding in the 2015 USGCRP report is that climate change will make American coastal and marine water warmer and therefore more hospitable to water-borne pathogens (P. 180-182). There was good, specific data in this section (p. 181, lines 1-9). In addition it should be mentioned that in the 1997/1998 El Nino in Peru, associated above-average temperatures led to a doubling of the number of children going to the hospital with diarrhea(Iwasa 222). A brief mention of the biology of why warm water fosters growth would be beneficial for the reader. There is only a brief mentioning that warm temperatures will expand the seasonal window of growth and the geographies open for growth. I would also like to see more evidence of positive feedback loops from eutrophication or other pathogen-friendly occurrences in the water (Iwasa, 220). A body of water has a finite supply of dissolved oxygen, and this oxygen can be consumed by eutrophication and</p>	Ch 5: Water-Related Illness		180	1	<p>Due to the size of the topic, and the page limit for the chapter, we focused on broad trends rather than delving too deeply or providing such a level of specificity. Where space permits, we have added clarifying text to better reflect the body of literature available for impacts within the US.</p>

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>lead to “dead zones”, as is seen in the Gulf of Mexico. It is mentioned on page 181, line 11 that there is uncertainty regarding the relationship amongst these pathogens. Even if there are differing scientific opinions as to the extent of these relationships, the reader would benefit from seeing the types or the extent of possible relationships between bacteria and how they influence each other.</p> <p>Extreme weather was also cited as a consequence of a warming planet on page 182, line 8. The report should expand upon the increasing frequency of heavy precipitation has increased, which is consistent with the science of warmer atmospheric temperatures and increased water vapor in the atmosphere (Jones, 237). In addition, the report cited that it was “very likely” that heavy precipitation events would increase over most areas. Extreme weather contributes to the spread of water-borne pathogens because instead of water slowly filtering through many layers of soil and rock into water sources, it forces run off over urban, agricultural, and suburban land and picks up the bacteria on those associated surfaces and allows them to flow into coastal, ground, and marine waters. While the USGCRP mentions the effects of the runoff generally, it fails to mention specific toxins that the public could expect from the runoff. A specific mentioning of bacteria that flourish in algal blooms would link the section on extreme weather (p. 182) to Figure 1 on page 165. In addition, frequently mentioning types of pathogens will make the public more familiar with the associated names, bringing awareness to the issue of water-borne pathogens and giving the entire chapter some fluidity.</p> <p>Iwasa, Yoh, Tomoe Uchida, and Hiroyuki Yokomizo. "Nonlinear behavior of the socio-economic dynamics for lake eutrophication control." <i>Ecological Economics</i> 63.1 (2007): 219-229.</p> <p>Jones, P. D., et al. "Observations: surface and atmospheric climate change." <i>IPCC, Climate change</i> (2007): 235-336.</p>					
Guido	Garcia	Clearly stating the relation of illness and death caused by changes in temperature and climate change should be at the core of USGCRP Climate & Health Assessment goals. Therefore every	Ch 2: Temperat ure-		53	15	Additional discussion of observed heat mortality has been added to the text.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>key finding should be clearly explained and backed up by conclusive facts.</p> <p>Sections 2.5 and 2.6 that deal with data collection and interpretation could better illustrated with an example in the form of a graph. A good addition to the chapter and to the section 2.5 "Measuring the Health Impact of Temperature" would be a graph that shows the annual rates for deaths classified as "heat-related" by medical professionals in the 50 states and the District of Columbia that can be found in the EPA website and supports the claim of an increasing death toll as a result of an increase in temperature in the past 20 years (CDC). Like the graph provided by the EPA that compares number of death per day to the temperature of that day during the Chicago heat wave of 1995,found in section 2.6 this graph shows valuable information of that link changes in temperature to a higher death toll. This graph also shows how the data changed after World Health Organization revised the international codes used to classify causes of death and supplement the explanation given in section 2.5 and 2.6 about the two approaches used to study the impact of temperature in health and specifically its relation to death. Before the data changed after World Health Organization revision there was only one classification of temperature related death, heat was listed as the main cause of death or nothing at all. After the revision temperature was listed as either the underlying main cause or contributing cause of death during the period of time studied.</p> <p>More information is needed to support the claim that population is becoming more tolerant to extreme heat and less to extreme cold temperatures and racial difference in heat tolerance together with the fact that the death from cold weather will decrease in the future. The evidence provided in section 2.6.2 "Evidence of Adaptation in Deaths from Temperature Extremes" is not conclusive since it is based on only one statistic and does not necessarily indicate that tolerance to extreme is increasing or that the deaths related to extreme heat will decrease in the future due to this behaviour. Even though physiological acclimatization can be argued by analyzing different geographies and its inhabitants it does not prove the fact like as a whole humans can adapt to extreme heat it just proves that some communities are more</p>	Related Impacts				<p>Regarding increasing tolerance to heat over time: multiple studies were cited in the text supporting this observation. No change has been made to the text.</p> <p>Regarding differential racial sensitivity, the need for more research on possible environmental and or genetic factors responsible for increased risk is noted in the Research Needs section. No change has been made to the text.</p>

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>prepared for it. Another claim that lacks of supportive evidence is the existence of a racial difference in heat tolerance. The statistic showing disproportional heat related death in black communities are based on the difference in living conditions, not in genetics so race should not be a factor in this conversation.</p> <p>Works Cited</p> <p>CDC (U.S. Centers for Disease Control and Prevention). 2012. CDC WONDER database. Accessed August 2012.</p>					
Taliesin	Chipman	<p>Comment: In your third chapter titled “Air Quality”, on page 92 in the box detailing the results of research into ozone-related health effects it is declared that maximum daily ozone will increase by 1 to 5 parts per billion. To start with I would recommend that the current average ozone levels be mentioned in this area, as to give the reader an idea of the scale of the increase. For the average citizen, seeing “1°C to 4°C (1.8°F to 7.2°F) increases in average daily maximum temperatures” is very engage able and relevant, as that data is something they can visualize in their minds. It’s innately relevant to their own lives, and they have plenty of experience in working with temperature values. However, the current atmospheric levels of ozone is not something that the average reader is likely to be able to comprehend in terms of what that means compared to current levels.</p> <p>According to the EPA and their National Ambient Air Quality Standards (NAAQS), the current quality standard in terms of ozone is 75 parts per billion (“National Ambient Air Quality Standards”). This means that the level of change in terms of total ozone level resulting due to purely natural causes will range between 1.333% and 6.667% of the maximum permitted ozone level. Not only this, but that level comes in the form of the fourth highest daily maximum 8 hour concentration, taken over a 3 year period. While not inconsequential, it is not as large an increase and many would probably believe it to be had they not undertaken further research.</p>	Ch 3: Air Quality		92	17	We appreciate this suggestion, but space is limited. The author team has deliberated and agreed on the most important information and illustrations to include.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>This should not be taken as a criticism of the work undertaken, on the contrary I believe the science to be sound. Instead this is just a recommendation that scale be given to the presented results. For example, in Texas, both my native Bexar county, and my current place of residence of Travis county have high ozone levels, with the EPA declaring them at 78 and 77 parts per billion respectively in 2006-2008 (“Counties Violating the Primary Ground-level Ozone Standard, 2006-2008”). While this makes the 1-5 parts per billion that climate change will add a relatively small part of the total, it also makes it in total violation of current standards. It must also be noted that this data is decently old. According to the report being commented upon, ozone levels grow in response to climate change, and as such have almost certainly been growing since 2008. In conclusion, I feel the report lacks context and detail around a fairly important piece of this particular argument.</p> <p>Citations:</p> <p>"Counties Violating the Primary Ground-level Ozone Standard, 2006 - 2008." (n.d.): n. pag. EPA. Web. 6 May 2015. <http://www.epa.gov/groundlevelozone/pdfs/CountyPrimaryOzoneLevels0608.pdf>.</p> <p>"National Ambient Air Quality Standards (NAAQS)." EPA. Environmental Protection Agency, 21 Oct. 2014. Web. 06 May 2015.</p>					
Taliesin	Chipman	<p>Comment: In your third chapter titled as “Air Quality”, on page 96 is a section titled ‘Climate Variability and Effects on Allergic Diseases’. In this section, despite mentioning that the role played by weather in allergenic symptoms is not well understood, the section brings up the argument that climate change would increase the burdens of allergic diseases. Indeed earlier in the chapter, on page 95 under “Climate Impacts on Aeroallergen Characteristics”, the paper presents the conclusion that climate change would exacerbate the suffering of allergy sufferers. I would like the differences between these two sections to be clarified. Perhaps it is just my misunderstanding on what is being said, but I am under the impression that these conclusions are made with an undisclosed level of uncertainty involved.</p>	Ch 3: Air Quality		95	22	Thank you, we have added citations and discussion regarding climate and pollen, and regarding particulate matter impacts of drought.

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		<p>My second comment is to what degree does climate change inhibit the spread of allergens? According to UNCCD, global climate change will be the cause of increased desertification worldwide, a condition marked by land degradation (“Climate Change...”). My point is that while climate change may indeed encourage the proliferation of plants such as the common ragweed in the Midwest as this draft argues, to what extent are allergens inhibited by this rise in temperature in already dry regions? For areas that plants already struggle to grow in, would this be enough to stifle pollen from those areas? A recent Stanford University report declared that the causes of the very public drought in California are linked with climate change (“Causes of California drought...”). As this drought is linked with climate change, I am curious whether the lack of rainfall will have a meaningful impact upon total pollen production, not just in California, but replicated worldwide, with many deserts and many droughts.</p> <p>Going back to the UNCCD data, degradation of topsoil caused by climate change may also have an effect upon pollen emissions, as this is land no longer fit for many plants. As plants are a major part of holding together topsoil, their loss would trigger soil degradation (“Climate Change...”). The famous Dustbowl of the early 20th century, while it came to be due to different reasons, can be used as an image of possible things to come. In these environments it would be incredibly tough for things to grow, rendering null areas that used to produce pollen. This is ignoring the health consequences of the vast quantities of particulates that would be thrown into the air. While these are not favorable things, they may have an impact on the overall numbers and may be worth considering.</p> <p>Citations:</p> <p>"Causes of California Drought Linked to Climate Change, Stanford Scientists Say." Stanford News. Stanford University, 30 Sept. 2014. Web. 06 May 2015. <http://news.stanford.edu/news/2014/september/drought-climate-change-092914.html>.</p> <p>"Climate Change, Drought and Desertification." Thematic Fact</p>					

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		Sheet Series 1 (n.d.): n. pag. UNCCD, 1 Jan. 2011. Web. 6 May 2015. < http://www.unccd.int/Lists/SiteDocumentLibrary/Publications/Desertificationandclimatechange.pdf >.					
Justin	G.	<p>This chapter left me wanting more given the high quantity of generalizations compared to those in the rest of the report. Specific examples include the introduction on pp. 752 (even though an introduction, it is still way too general), the beginning of section 7.5.1 (pp. 259), and most paragraphs on page 260. Specific examples are needed.</p> <p>Lines 23-26 of Page 269 explains why this chapter contains so many generalizations. Given the text of these lines, I am a little unclear as to the reason for this chapter. There isn't much attention paid to this topic, so why devote an entire chapter to it? I found this chapter to be devoted to a logical loop: e.g.:</p> <p>extreme precipitation -> floods -> drowning</p> <p>climate change -> more extreme precipitation</p> <p>Hence more drowning.</p> <p>The chapter fails to take into account human capability for adaptation and response, and assumes a linear response curve: (more or intense extremes->more of climate change impact). This is unfortunate as the topic is fascinating.</p>	Ch 7: Extreme Events				<p>We appreciate the suggestion, but feel the point raised in this comment is beyond the scope of this chapter. The chapter focuses on broad trends and provides specific examples when appropriate and supported by the peer-reviewed scientific literature. The text has been revised to more explicitly describe the role of adaptive capacity in mediating extreme events event-related health impacts. The assessment does not include detailed discussions of climate adaptation or other policy response. Consideration of human adaptive capacity has been included as appropriate to assess projected climate impacts on human health.</p>
Justin	G.	Does the "coming century" refer to the 22nd Century? If so, I am very intrigued given the high level of uncertainty and the fact that many models don't project out that far.	Ch 7: Extreme Events		252	22	Thank you for your comment. The text has been revised to incorporate this suggestion.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
Justin	G.	"Heavy downpours are increasing nationally:" Please clarify which attribute of these downpours are increasing. Frequency? Intensity? Change in geographical distribution?	Ch 7: Extreme Events	1	253		The text has been revised to incorporate this suggestion.
Justin	G.	Regarding the sea level rise description on the first row, it would be helpful to either state that the 8 inches is geographically variable, or to provide a value specific to the US since this taken from the 3rd National Climate Assessment.	Ch 7: Extreme Events	1	253		We appreciate this suggestion. The text has been revised to incorporate this suggestion.
Justin	G.	Regarding drought, please clarify the meaning of "Droughts have changed over the last couple decades, with patterns and trends varying regionally across the United States." Patterns and trends in severity? Frequency? Intensity? This sentence reads a little awkwardly as written.	Ch 7: Extreme Events	1	253		The text has been revised to incorporate this suggestion.
Justin	G.	Regarding "increased warming, drought, and insect outbreaks, all caused by or linked to climate change,"... Can we definitively state this? Not every event is caused by or linked to climate change. I find the use of the word "all" to be extremely problematic, and doesn't easily reconcile with Lines 23 - 26 on Page 269.	Ch 7: Extreme Events	1	253		We appreciate this suggestion; however, this content has been directly cited from the NCA3.
Justin	G.	"Trends in severe storms" Please clarify the nature or attribute of the trends: trends in intensity, etc. of severe storms? Also, is the term "uncertain" meant to correspond to the scientific meaning of the term or to refer that scientists are unsure about the topic?	Ch 7: Extreme Events	1	254		The text has been revised to incorporate this suggestion.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
Justin	G.	<p>Given the nature of geographical, cultural, and physiographic diversity inherent found in the many rural communities in the US, I am unsure about the meaning of "unique." I advise rephrasing this sentence to say that their vulnerabilities may differ from those of urban ones.</p> <p>Also, I find the description on lines 17-19 to be way too general. The idea that power and communications can take longer to restore is probably too specific an item for which to cite the Third National Climate Assessment. If that Assessment states it, I greatly recommend citing the source cited in that assessment for this assertion.</p>	Ch 7: Extreme Events		254	17	The text has been revised to incorporate this suggestion.
Justin	G.	This sounds repetitive.	Ch 7: Extreme Events		255	19	The text has been revised to incorporate this suggestion.
Justin	G.	Population has increased in the Coast, but the authors have not established this to be a function of migration (i.e. could it be that birth rates are higher on the Coast?) This can be avoided if "shifts" on Line 25 can be replaced with "migrations," as "shifts" simply means changes to me.	Ch 7: Extreme Events		255	36	The text has been revised to incorporate this suggestion.
Justin	G.	The text says "the population along coastal areas is increasing, " Nevertheless, so is the Coastal Population of the US as a whole. Is the population on the coast increasing in a higher proportion relative to the rest of the country? Please clarify the meaning and/or significance of the sentence.	Ch 7: Extreme Events		255	36	The text has been revised to incorporate this suggestion.
Justin	G.	The text does a great job justifying the use of a "qualitative" understanding. Nonetheless, what value does a qualitative understanding provide if can't be computed? Currently, the text reads akin to "While these events are difficult to quantify due to the numerous complexities, scientists know the answer anyway," which I don't think is what the authors mean to say. I therefore suggest rephrasing, elaborating on the value of qualitative reasoning for this type of research using specific examples, or tossing this part of the discussion entirely.	Ch 7: Extreme Events		256	1	The text has been revised to incorporate this suggestion.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
Justin	G.	What about during extreme events (e.g. power gets knocked out during a storm or flood?) What about very long-lasting droughts?	Ch 7: Extreme Events		256	6	After consideration of this point, we still feel the existing text is clear and accurate. All extreme events have the ability to compromise infrastructure. No change has been made to the text.
Justin	G.	Is this entirely true? Is it applicable for all infrastructure? What is a "stable weather pattern?" Does the statement also pertain to instances of infrastructure being designed for one weather characteristic but which would fail because of the increased intensity of that characteristic? (e.g. increased flooding in an area in which homes were constructed to handle a certain amount of flooding?) Also, the beginning of the sentence reads awkwardly. Do the authors mean "is designed," or "are generally designed?"	Ch 7: Extreme Events		256	11	The text has been revised to replace the term "stable" in the sentence and improve sentence clarity by referring to historical weather patterns.
Justin	G.	More examples can be very helpful here.	Ch 7: Extreme Events		256	23	After consideration of this point, we still feel the existing text is clear and accurate. No change has been made to the text.
Justin	G.	This portion seems very general and therefore doesn't introduce much of anything "new." I recommend removing.	Ch 7: Extreme Events		256	17	After consideration of this point, we still feel the existing text is clear and accurate. No change has been made to the text.
Justin	G.	I am a little confused as to why these patients were affected after the Hurricane and not during? Having not looked at the works cited on lines 14-15, were these patients affected because of damage to transportation infrastructure and population displacement (see lines 6-8). I recommend elaborating on this. Also, as one example doesn't make a trend, have there been studies about the impacts of other hurricanes, storms, etc. to back up the point of this paragraph? If so, I recommend adding them.	Ch 7: Extreme Events		257	12	The text has been revised to incorporate this suggestion.
Justin	G.	I'm afraid I don't see the relevance of these two examples. Are they included because they were tied to extreme weather events, which we are expecting more of with climate change? If so, aren't there other extreme events that didn't produce as many dire results. Similarly, can't the agents causing fecal-borne diseases pass through a water system even in the absence of extreme events? If so, then how much of the outbreak in Milwaukee was actually	Ch 7: Extreme Events		258	1	The text has been revised to incorporate this suggestion.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		caused by the extreme event relative to the other factors mentioned? Addressing all of this would communicate the intended point much more cogently.					
Justin	G.	Although I understand the reason for the use of "may," its inclusion greatly dilutes the point. Why is this paragraph worth mentioning if the risk may increase? It may increase; it may decrease. It also left me asking if the rest of the chapter preceding this was hypothetical as well. In other words, I think the word "may" needs to be removed here.	Ch 7: Extreme Events		259	20	After consideration of this point, we still feel the existing text is clear and accurate. No change has been made to the text.
Justin	G.	I'm curious: are the rural areas studied situated in low-lying areas? If so, I'd mention that. The assertion described in the text is interesting because rural areas would be more forested or agricultural than urban areas, contributing to greater infiltration (although the presence of storm sewers on urban roads may negate that point). Also, I'd be curious if more flash floods hit rural areas than urban ones. If so, I recommend adding a clause to the effect of "even when accounting for changes in frequency among rural or urban."	Ch 7: Extreme Events		260	16	The text has been revised to improve clarity and incorporate additional detail from the citation regarding rural vs. urban flash flooding impacts.
Justin	G.	I recommend defining "severe storms" since although the term is used a lot, the meaning is not well-known.	Ch 7: Extreme Events		265	29	After consideration of this point, we still feel the existing text is clear and accurate. No change has been made to the text.
Justin	G.	In general, URLs are not necessary in bibliographic entries listing DOIs. As most chapters in this report follow that practice, I'd recommend removing the URLs in such cases in this chapter.	Ch 7: Extreme Events				All formatting of references have been standardized across the report according to the Style Guide.
Justin	G.	I'm unclear as to the meaning of the asterisk; I think it denotes an author or something, and as such can be removed.	Ch 7: Extreme Events		279	35	All formatting of references have been standardized across the report according to the Style Guide.
Justin	G.	"Access to dialysis centers" seems to be rather specific compared to the other items listed in this figure.	Ch 7: Extreme Events	2	290		The figure has been revised and no longer includes mention of access to dialysis centers.
Justin	G.	Suggest rephrasing "Hurricanes are an important contributor to flooding" to "Hurricanes are important contributors to flooding."	Ch 7: Extreme Events	3	291		The text has been revised to incorporate this suggestion.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
Justin	G.	I'm afraid I don't understand the purpose of this picture, as I don't think it adds anything to the text.	Ch 7: Extreme Events	4	292		The graphic has been changed to reflect this perspective.
Jennifer	Lowry	<p>I am commenting on the increased prevalence of asthma in children due to climate change. While there is some evidence in the chapter regarding expectations of exacerbation of asthma with climate change, the support that you offer regarding increasing prevalence of asthma with climate change is not clearly discussed. I have included below, particular studies and reviews that address this issue and hope that you will look into this a bit more to strengthen the case that climate change will increase the prevalence of asthma in children.</p> <p>1: Albertine JM, Manning WJ, DaCosta M, Stinson KA, Muilenberg ML, Rogers CA.</p> <p>Projected carbon dioxide to increase grass pollen and allergen exposure despite higher ozone levels. PLoS One. 2014 Nov 5;9(11):e111712. doi: 10.1371/journal.pone.0111712. eCollection 2014. PubMed PMID: 25372614; PubMed Central PMCID: PMC4221106.</p> <p>2: Kim J, Lim Y, Kim H. Outdoor temperature changes and emergency department visits for asthma in Seoul, Korea: A time-series study. Environ Res. 2014 Nov;135:15-20. doi: 10.1016/j.envres.2014.07.032. Epub 2014 Sep 27. PubMed PMID:</p>	Ch 9: Populations of Concern				<p>We have added references; however, space limitations preclude adding them all.</p> <p>The following citations have been reviewed and incorporated where appropriate, specifically with respect to aeroallergens and the exacerbation of asthma in children. Of the citations suggested by the reviewer, we ultimately included the following "new" references.</p> <p>D'Amato G. 2011. Effects of climatic changes and urban air pollution on the rising trends of respiratory allergy and asthma. Multidiscip Respir Med. 2011 Feb 28;6(1):28-37. doi: 10.1186/2049-6958-6-1-28. PubMed PMID: 22958620; PubMed Central PMCID: PMC3463061.</p> <p>Schmier JK, Ebi KL. 2009. The impact of climate change and aeroallergens on children's health. Allergy Asthma Proc. 2009 May-Jun;30(3):229-37. doi: 10.2500/aap.2009.30.3229. Review. PubMed PMID: 19549423.</p>

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		<p>25261859.</p> <p>3: Xu Z, Huang C, Hu W, Turner LR, Su H, Tong S. Extreme temperatures and emergency department admissions for childhood asthma in Brisbane, Australia. Occup Environ Med. 2013 Oct;70(10):730-5. doi: 10.1136/oemed-2013-101538. Epub 2013 Jul 24. PubMed PMID: 23884454.</p> <p>4: Bernstein AS, Rice MB. Lungs in a warming world: climate change and respiratory health. Chest. 2013 May;143(5):1455-9. doi: 10.1378/chest.12-2384. PubMed PMID: 23648909.</p> <p>5: D'Amato G, Baena-Cagnani CE, Cecchi L, Annesi-Maesano I, Nunes C, Ansotegui I, D'Amato M, Liccardi G, Sofia M, Canonica WG. Climate change, air pollution and extreme events leading to increasing prevalence of allergic respiratory diseases. Multidiscip Respir Med. 2013 Feb 11;8(1):12. doi: 10.1186/2049-6958-8-12. PubMed</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>PMID: 23398734; PubMed Central PMCID: PMC3598823.</p> <p>6: Bielory L, Lyons K, Goldberg R. Climate change and allergic disease. Curr Allergy Asthma Rep. 2012 Dec;12(6):485-94. doi: 10.1007/s11882-012-0314-z. Review. PubMed PMID: 23065327.</p> <p>7: Dapul-Hidalgo G, Bielory L. Climate change and allergic diseases. Ann Allergy Asthma Immunol. 2012 Sep;109(3):166-72. doi: 10.1016/j.anai.2012.02.008. Review. PubMed PMID: 22920070.</p> <p>8: Thompson AA, Matamale L, Kharidza SD. Impact of climate change on children's health in Limpopo Province, South Africa. Int J Environ Res Public Health. 2012 Mar;9(3):831-54. doi: 10.3390/ijerph9030831. Epub 2012 Mar 8. PubMed PMID: 22690167; PubMed Central PMCID: PMC3367281.</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>9: Anderson HR, Butland BK, van Donkelaar A, Brauer M, Strachan DP, Clayton T,</p> <p>van Dingenen R, Amann M, Brunekreef B, Cohen A, Dentener F, Lai C, Lamsal LN,</p> <p>Martin RV, One IP. Satellite-based estimates of ambient air pollution and global variations in childhood asthma prevalence. Environ Health Perspect. 2012 Sep;120(9):1333-9. doi: 10.1289/ehp.1104724. Epub 2012 May 1. PubMed PMID: 22548921; PubMed Central PMCID: PMC3440118.</p> <p>10: Weber RW. Impact of climate change on aeroallergens. Ann Allergy Asthma Immunol. 2012 May;108(5):294-9. doi: 10.1016/j.anai.2011.11.012. PubMed PMID: 22541397.</p> <p>11: Szema AM. Climate change, allergies, and asthma. J Occup Environ Med. 2011 Dec;53(12):1353-4. doi: 10.1097/JOM.0b013e318237a00d. PubMed PMID: 22157641.</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>12: Sheffield PE, Knowlton K, Carr JL, Kinney PL. Modeling of regional climate change effects on ground-level ozone and childhood asthma. Am J Prev Med. 2011 Sep;41(3):251-7; quiz A3. doi: 10.1016/j.amepre.2011.04.017. PubMed PMID: 21855738; PubMed Central PMCID: PMC3160600.</p> <p>13: Bush RK. The impact of climate change on ragweed pollination. Curr Allergy Asthma Rep. 2011 Oct;11(5):341. doi: 10.1007/s11882-011-0205-8. PubMed PMID: 21720856.</p> <p>14: Sheffield PE, Weinberger KR, Kinney PL. Climate change, aeroallergens, and pediatric allergic disease. Mt Sinai J Med. 2011 Jan-Feb;78(1):78-84. doi: 10.1002/msj.20232. Review. PubMed PMID: 21259264; PubMed Central PMCID: PMC3075981.</p> <p>15: D'Amato G. Effects of climatic changes and urban air pollution on the rising</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>trends of respiratory allergy and asthma. Multidiscip Respir Med. 2011 Feb</p> <p>28;6(1):28-37. doi: 10.1186/2049-6958-6-1-28. PubMed PMID: 22958620; PubMed</p> <p>Central PMCID: PMC3463061.</p> <p>16: D'Amato G, Cecchi L, D'Amato M, Liccardi G. Urban air pollution and climate change as environmental risk factors of respiratory allergy: an update. J</p> <p>Investig Allergol Clin Immunol. 2010;20(2):95-102; quiz following 102. Review.</p> <p>PubMed PMID: 20461963.</p> <p>17: Changes in weather may trigger child's asthma. Eur Ann Allergy Clin Immunol.</p> <p>2009 Oct;41(5):160. PubMed PMID: 20101931.</p> <p>18: Schmier JK, Ebi KL. The impact of climate change and aeroallergens on children's health. Allergy Asthma Proc. 2009 May-Jun;30(3):229-37. doi:</p> <p>10.2500/aap.2009.30.3229. Review. PubMed PMID: 19549423.</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>19: Shea KM, Truckner RT, Weber RW, Peden DB. Climate change and allergic disease. J Allergy Clin Immunol. 2008 Sep;122(3):443-53; quiz 454-5. doi: 10.1016/j.jaci.2008.06.032. Review. PubMed PMID: 18774380.</p> <p>20: Shah A. Global warming, climate change, air pollution and allergic asthma. Indian J Chest Dis Allied Sci. 2008 Jul-Sep;50(3):259-61. PubMed PMID: 18630790.</p>					
US	EPA	"Congressional mandate" should be more specific. Cite the GCRA here.	Ch 1: Preface and Introduction		23	6	Citation to the GCRA added.
US	EPA	Is it clear to the audience what "climate mitigation and adaptation" refers to?	Ch 1: Preface and Introduction		24	6	This text is part of the preface, and the authors feel it an inappropriate place to define these terms. The terms are defined in the text of the report and are included as part of the USGCRP glossary.
US	EPA	"This chapter" may cause confusion. Suggest changing to "The final chapter"	Ch 1: Preface and Introduction		24	19	The text has been revised to incorporate this suggestion.
US	EPA	This suggests that the climate-related health impacts that are already underway are clearly attributable to "climate change" (although that term has not been defined). It's not clear that we are able to so clearly and consistently attribute many of the observed impacts to the effects of increased GHG concentrations and subsequent warming. This point needs to be consistent with the discussion that follows regarding the long-term characteristics of	Ch 1: Preface and Introduction		25	16	This language is taken directly from the 2014 NCA3 and the authors have determined that it is appropriate to directly quote this source. It refers to health impacts such as those associated with changing pollen seasons and warming oceans that are most clearly attributable to a changing climate.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		climate change. Suggest noting that the changes in health impacts are consistent with our understanding of climate change and are expected to worsen as climate change intensifies (as it is expected to do).					
US	EPA	Suggest changing "underway" to "being experienced"	Ch 1: Preface and Introduction		25	16	This language is a direct quote from the 2014 NCA3 and the authors have determined that it is appropriate to directly quote this source. The authors decided that an alternative statement of the same information is not desirable.
US	EPA	Suggest changing "will change" to "expected to change"	Ch 1: Preface and Introduction		26	32	The text has been revised to incorporate this suggestion.
US	EPA	Suggest changing "greenhouse gas concentrations" to "atmospheric greenhouse gas concentrations" or "concentrations of greenhouse gases in the atmosphere"	Ch 1: Preface and Introduction		26	36	Preceding text has been revised to clarify this point; however, the authors feel the subsequent use of this extended clarification is not needed, as it adds length without improving understanding.
US	EPA	This point should be clarified. We are not projecting colder extremes, but warmer/hotter extremes. As stated, one could understand that we expect to see extremes at either end of the scale.	Ch 1: Preface and Introduction		27	10	The text has been revised to clarify.
US	EPA	Similarly, this discusses precipitation extremes and drought separately, although the drought represents one extreme for precipitation. If extreme precipitation is intended to mean heavy downpours or snow events (e.g., the upper end of the extremes), that should be made explicit.	Ch 1: Preface and Introduction		27	13	Because drought can be caused by warming temperatures and or changes in soil moisture, and can also be influenced by other factors (e.g. land use), the authors feel combining these bullet points to suggest drought is the opposite extreme of precipitation, or the opposite of extreme precipitation events, would be inappropriate. Extreme precipitation is defined in the USGCRP glossary and that standard definition is used here unless additional specifications are noted (e.g. Figure 2). Therefore, the text has not been altered.
US	EPA	Suggest changing "predictable" to "anticipated" - "predictable" implies too much accuracy in terms of timing and location.	Ch 1: Preface		28	29	Thank you for the comment. The authors do not agree that the word predictable implies

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			and Introduction				more accuracy than anticipated. The authors feel the meaning would be changed to suggest greater certainty of occurrence if "anticipated" were used; therefore the text has not been altered.
US	EPA	Change "may be too slow" to "may be to slow"	Ch 1: Preface and Introduction		29	5	The text has been revised to incorporate this suggestion.
US	EPA	Suggest changing "17%" to "an additional 17%"	Ch 1: Preface and Introduction		30	4	The text has been revised to incorporate this suggestion.
US	EPA	This bullet point does not provide information about trends. It is a single point in time and does not provide any insight into how income differences have changes as related to minority status. Suggest either dropping this bullet or adding information that provides some indication of the trend over time.	Ch 1: Preface and Introduction		30	6	A new reference showing recent trends in household worth has been added.
US	EPA	"emergent" weather conditions are not necessarily dangerous. Suggest changing to "emergent extreme" weather conditions.	Ch 1: Preface and Introduction		30	17	The text has been revised to clarify.
US	EPA	The daily ambient temperature is more accurately an indicator of exposure, as many people will be indoors and not exposed to the high temperature. There will be a range of factors that determine actual exposure; whether this is the appropriate place to raise these issues is debatable, but it may be appropriate to at least note here the complexities that underly the measures.	Ch 1: Preface and Introduction		34	34	Thank you for your comment. This is intended to be as simple as possible an explanation for the lay reader. We agree with the commenter that this is not the place to emphasize the complexity. This is done in great detail in on the chapter on temperature extremes.
US	EPA	Suggest italicizing "risk" here (as done in line 29) to ensure it is distinguished from actual outcome.	Ch 1: Preface and Introduction		35	24	Thank you for your comment. The term risk is italicized to contrast it with the term impacts, which is used two sentences down. The authors believe this addresses the commenter's concerns; therefore, the text has not been altered here.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
US	EPA	It is unclear what "two model-scenario examples" indicates. Is this two combinations of models and scenarios (data for 2 scenarios from each of 2 models)?	Ch 1: Preface and Introduction		36	8	Text has been revised to clarify.
US	EPA	This paragraph should tie back to modeling in some way. This simply reiterates that economic valuation was not done for the analyses. Given the topic of this section, it is better to note explicitly that economic modeling was not part of the analyses conducted for the assessment.	Ch 1: Preface and Introduction		36	17	The text has been revised to incorporate this suggestion.
US	EPA	Suggest changing the order of the factors that influence uncertainty in future climate conditions (concentrations followed by sensitivity).	Ch 1: Preface and Introduction		36	32	The text has been revised to incorporate this suggestion.
US	EPA	For Figures 2, 3, and 4, the publication from which each figure was taken should be cited, not just the organization that developed the figures.	Ch 1: Preface and Introduction	2	45		Several of these figures were developed for this assessment. Figures published elsewhere in peer review literature have been cited appropriately.
US	EPA	"increase in future deaths" should be "projected increase in future deaths"	Ch 2: Temperature-Related Impacts		51	24	The text has been revised to incorporate this suggestion.
US	EPA	Clarify - what is meant by "nighttime" and "daytime" temperatures? Are these peak, average, other?	Ch 2: Temperature-Related Impacts		52	30	The text has been revised to clarify.
US	EPA	Unclear what "This information" refers to. Presume this refers to Heat Index, but it's not clear	Ch 2: Temperature-Related Impacts		53	11	The text has been clarified to address this comment.
US	EPA	Noun-verb mismatch: "...calculated relationship...are highly variable..."	Ch 2: Temperature-		53	18	The text has been revised to incorporate this suggestion.

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			Related Impacts				
US	EPA	Seems to imply that statistical methods determine causality as opposed to association. Need to be clear that the statistical relationships do not determine causality.	Ch 2: Temperature-Related Impacts		54	3	The text has been revised to incorporate this suggestion.
US	EPA	Do these methods also account for air pollution? The connection between temperature and air pollution is addressed in Ch 3, and would be appropriate to note here.	Ch 2: Temperature-Related Impacts		54	12	Some updates have been made to the text.
US	EPA	May be appropriate to note here that the relationship between temperature and mortality seems stronger with high nighttime temperatures, even though nighttime temperatures are lower.	Ch 2: Temperature-Related Impacts		54	32	After consideration of this point, the authors determined that the point is already addressed in the chapter. No change has been made to the text.
US	EPA	It's not clear what is meant by "different pools of events." Is this different death events or different weather events? Both? Worth being more explicit that statistical methods help identify heat as a contributing factor rather than a primary cause.	Ch 2: Temperature-Related Impacts		55	6	The text has been revised to address this comment.
US	EPA	Would be good to preface this sentence with something like "It is reasonable to expect that deaths..."	Ch 2: Temperature-Related Impacts		55	25	The text has been revised to incorporate this suggestion.
US	EPA	"was responsible" should be "has been estimated to be responsible"	Ch 2: Temperature-Related Impacts		56	1	The text has been revised to incorporate this suggestion.
US	EPA	It would be good to be more explicit about the type of modeling studies that are being discussed here - presume these are statistical models, but that's unclear	Ch 2: Temperature-Related Impacts		56	31	The text has been revised to incorporate this suggestion.

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US	EPA	Suggest discussing "depletion of the susceptible population subset" into a separate sentence - this is different than physiological acclimatization.	Ch 2: Temperature-Related Impacts		57	16	We agree with the comment and the text has been revised to improve clarity.
US	EPA	Is it "greenspace" or "green space"?	Ch 2: Temperature-Related Impacts		57	27	The text has been adjusted throughout the chapter to read "green space".
US	EPA	Providing a public access does not seem to be a change in personal behavior, but is instead a public agency/community response.	Ch 2: Temperature-Related Impacts		57	33	We agree and the text has been revised accordingly.
US	EPA	This is unclear. Does this mean that the associations with extreme heat vary by setting, or that the risks themselves vary?	Ch 2: Temperature-Related Impacts		58	31	After consideration of this point, the authors determined that the existing text is clear. No change has been made to the text.
US	EPA	Suggest changing this to "Studies addressing individual states or cities in the United States project an increase...temperature, including studies of Chicago..."	Ch 2: Temperature-Related Impacts		59	18	The text has been revised to incorporate this suggestion.
US	EPA	Presume these are state and national studies in terms of scope as opposed to in terms of authorship or responsibility for conducting the studies. Suggest "...than the studies that are national is scope."	Ch 2: Temperature-Related Impacts		59	26	The text has been revised to incorporate this suggestion.
US	EPA	"...may negate these adaptive benefits..." seems too strong. Outages can certainly negate the benefits to an extent, but not completely.	Ch 2: Temperature-Related Impacts		60	24	The text has been revised to incorporate this suggestion.
US	EPA	Need to be more explicit about what temperatures are being used. Presume this is average daily temperature, but that is not clear.	Ch 2: Temperature-		61	3	The text has been revised to incorporate this suggestion.

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			Related Impacts				
US	EPA	Suggest consistency in referring to ethnicities. "non-Hispanic blacks" vs. "Hispanic persons". Suggest making sure that we refer to "persons" in each case. See also Chapter 9.	Ch 2: Temperature-Related Impacts		63	22	The text has been revised to have more consistency in referencing
US	EPA	What about wintertime disruptions in power? This is addressed in Chapter 7 in reference to CO poisoning.	Ch 2: Temperature-Related Impacts		64	16	The text has been revised to address the potential impacts of both extreme heat and cold on disruptions in power. The author team believes it is not necessary to provide additional reference to carbon monoxide poisoning or other indirect effects of these events in the chapter.
US	EPA	The TSU and Steering Committee have not been noted prior to this point; it would be good to provide some information on their role. Also need to clarify why the TSU has input into the key findings, as they are presumably not the health experts.	Ch 2: Temperature-Related Impacts		66	10	The introduction to the Supporting Evidence section was revised to be consistent across chapters.
US	EPA	The uncertainties section does not seem to address uncertainties.	Ch 2: Temperature-Related Impacts		67	11	The text has been revised to incorporate this suggestion.
US	EPA	The uncertainties section does not seem to address uncertainties.	Ch 2: Temperature-Related Impacts		69	16	The text has been revised to incorporate this suggestion.
US	EPA	This paragraph describes a heat wave in Chicago in 1995. There is a citation on line 24 that appears related to the mortality analysis for this heat wave, "(CDC 1994)", yet this reference appears to be for an earlier heat wave in Philadelphia.	Ch 2: Temperature-Related Impacts		55	16	We appreciate this error being identified. The issue has been corrected with the addition of "CDC 1995" to the text as the reference and the associated work has been added to the listed References.
US	EPA	Spell out ASPPH	Ch 3: Air Quality		87	20	The text has been revised to incorporate this suggestion.

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US	EPA	Remove hyphen between free and troposphere	Ch 3: Air Quality		90	23	The text has been revised to incorporate this suggestion.
US	EPA	Is upstream or upwind more appropriate here?	Ch 3: Air Quality		91	10	The text has been revised to incorporate this suggestion.
US	EPA	This paragraph needs to be clarified. At the beginning, it notes that most of a person's exposure to outdoor pollutants occurs indoors. At the end, it suggests that the elderly are at less risk to high ozone because they spend most of their time indoors. It seems that the point needs to be made regarding exposure to different levels of pollutants - the indoor exposures may be longer, but at lower levels and most exposure to high ozone occurs outdoors.	Ch 3: Air Quality		97	22	The text has been revised to incorporate this suggestion.
US	EPA	Revise the sentence to read as follows: "Indoors, ozone concentrations are usually about 10% to 50% lower than of outdoor concentrations; however, since people spend most of their time indoors, most of their exposure to ozone is from indoor air (Weschler 2006; Fisk 2015)." Comment: The 10% lower limit refers to a indoor:outdoor ratio of 0.1, while the original text states 10% lower than outdoor levels implying an indoor:outdoor ratio of 0.9, which is not correct.	Ch 3: Air Quality		97	22	The text has been revised to incorporate this suggestion.
US	EPA	Revise the reference citation as follows: "(Mudarri and Fisk 2007; Fisk et al. 2010)" and add the following to the References section: Fisk, W. J., E. Eliseeva, and M.J. Mendell, 2010: Association of residential dampness and mold with respiratory tract infections and bronchitis: a meta-analysis. Environmental Health, 9:72. doi:10.1186/1476-069X-9-72. [Available online at http://www.ehjournal.net/content/9/1/72] Comment: This is needed to support the statement "between 8% and 20% of several common respiratory infections, such as acute bronchitis" in lines 9-10.	Ch 3: Air Quality		99	9	The text has been revised to incorporate this suggestion.
US	EPA	Explanation of why climate change may increase mold and VOCs would be helpful.	Ch 3: Air Quality		89	16	This topic is covered briefly in section 3.5. Due to space limitations we not repeating it here.
US	EPA	It would help with reading this paragraph if the list of variables was in the same order as the explanation of the variables below.	Ch 3: Air Quality		90	6	The text has been revised to incorporate this suggestion.
US	EPA	May want to reference the other parts of climate change that increase ozone here or say see below for other aspects of a changing climate that influence O3.	Ch 3: Air Quality		91	1	After consideration of this point, we still feel the existing text is clear and accurate.
US	EPA	I think this statement could benefit from more explanation.	Ch 3: Air Quality		91	16	After consideration of this point, we still feel the existing text is clear and accurate.

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US	EPA	Line 36 starting with the word "Contaminants" ending on line 37 with the word 'pollen'. I would include a phrase to explain that they are not all of the contaminants. "to name a few" " including but not limited to"	Ch 3: Air Quality		96	36	Sentence has been modified to improve clarity.
US	EPA	include molds.	Ch 3: Air Quality		97	10	Agreed, done. Edit incorporated to line 19 on page 96.
US	EPA	include cracks and crevices in building envelope	Ch 3: Air Quality		97	11	Agreed, done.
US	EPA	use the word 'may be' instead of will. There may be changes because most of these will (in mechanically ventilated buildings pass through filters) .	Ch 3: Air Quality		97	16	We deleted this sentence.
US	EPA	change 'will' to 'may'	Ch 3: Air Quality		97	19	The text has been revised to incorporate this suggestion.
US	EPA	delete the word ' somewhat' it either may or may not.	Ch 3: Air Quality		97	20	After consideration of this point, we still feel the existing text is clear and accurate. The word indicates that the reduction will be “to some extent” and not necessarily make up for increased concentrations.
US	EPA	change 'for' to 'in'	Ch 3: Air Quality		97	21	The text has been revised to incorporate this suggestion.
US	EPA	what kind of vents is this referring to?	Ch 3: Air Quality		97	32	After consideration of this point, we still feel the existing text is clear and accurate.
US	EPA	air temperature, barometric pressure (wind).	Ch 3: Air Quality		97	33	The text has been revised to incorporate this suggestion
US	EPA	change out the words ' similar' to 'homogeneous'	Ch 3: Air Quality		97	34	After consideration of this point, we still feel the existing text is clear and accurate
US	EPA	infiltration is different for all buildings especially for mechanically ventilated vs buildings with no mechanical systems. Homes vs large buildings (various types depending on the use, construction, maintenance, age). Can't group them all together.	Ch 3: Air Quality		98	3	Agreed that the importance of different types of ventilation is different for different buildings. We added that the results are specific to residential buildings. Infiltration as used in the literature cited however is based on the same physical drivers. The analysis examines changes in infiltration per unit area of exchange surface, and therefore describes changes for each building when compared to itself. In that respect, the factors mentioned do not affect the generalizability of the results.

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US	EPA	temperature changes indoors vs outdoors and wind speeds are not the only variables that contribute to infiltraton changes or affects indoors vs outdoors.	Ch 3: Air Quality		98	6	Correct. Building-specific characteristics are important and taken into account, as the analysis indicate changes for a building compared to itself. Changes in use of the building (e.g. natural and mechanical ventilation) were explicitly excluded from the model, as they reflect adaptation
US	EPA	depending on the age of the materials, off gassing of damp materials may not occur	Ch 3: Air Quality		99	7	Due to the size of the topic, and the page limit for the chapter, we focused on broad trends rather than delving too deeply or providing such a level of specificity.
US	EPA	also loss of non functioning filtration systems and lack of proper circulations indoors also leads to indoor mold growth and increased levels of indoor contaminants	Ch 3: Air Quality		99	16	The text has been revised to explicitly make this point and incorporate this suggestion.
US	EPA	include other fossil fuel or wood burning appliances such as gas stoves, unvented hot water heaters, furnances.	Ch 3: Air Quality		99	21	The text has been revised to reflect this suggestion.
US	EPA	delete the word 'harm' and use the word 'exposure and health affects'.	Ch 3: Air Quality		99	25	After considering this comment, we believe the existing text is both clear and accurate.
US	EPA	Need to provide the actual company, rather than "EPA Contractor." If he is an independent consultant, that should be noted.	Ch 4: Vectorborne Diseases		122	10	The text has been revised to incorporate this suggestion.
US	EPA	Not sure that these vectorborne diseases are of "great public health concern" in the context of diet, exercise, smoking, and other public health issues. "Significant" or "substantial" would seem to be more appropriate.	Ch 4: Vectorborne Diseases		124	5	The text has been revised to incorporate this suggestion.
US	EPA	Need to clarify - was the "as much as 10 weeks" the measured variability during the period 1992 to 2007, or is this a direct comparison between the two years?	Ch 4: Vectorborne Diseases		126	36	After consideration of this point, we still feel the existing text is clear and accurate.
US	EPA	Unclear - does the "resulting in" refer to geographic variation separately from increased opportunity for contracting Lyme disease, or does "geographic variation" refer to both transmission cycles and increased opportunity?	Ch 4: Vectorborne Diseases		128	25	The sentence identified has been rearranged to incorporate your suggestion.
US	EPA	Does "warmer temperatures" refer to average, minimum, maximum? In the context, would seem to refer to warmer minimum temperatures.	Ch 4: Vectorbo		129	11	Due to the size of the topic, and the page limit for the chapter, the authors focused on broad

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
			rne Diseases				trends rather than delving too deeply or providing such a level of specificity.
US	EPA	Seems that there is a more straightforward way to convey this idea - appears to say that the association between climate and nymph density is likely an indication of more complex ecosystem responses to climate - true?	Ch 4: Vectorborne Diseases		130	2	While the comment suggests a good editorial change, the authors feel the existing text is adequate and more specific than the proposed revision.
US	EPA	Are these average temperatures, highs, other?	Ch 4: Vectorborne Diseases		131	1	The text has been revised to incorporate this suggestion.
US	EPA	Increased extreme precipitation may be a change in climate, but flooding and runoff are consequences of climate change.	Ch 5: Water-Related Illness		169	13	The commenter does not request a change or suggest an edit. No change has been made to the text.
US	EPA	"climate change is not expected to substantially increase the risk of contracting a water-related illness" - this may be true for drinking water but as stated, it implies a much broader applicability.	Ch 5: Water-Related Illness		169	23	This statement was made in the context of drinking water, in the drinking water section of the chapter. After consideration of this point, we still feel the existing text is clear and accurate. No change has been made to the text.
US	EPA	Unclear why traveling long distance is a factor.	Ch 5: Water-Related Illness		170	25	The chapter focused on broad trends for the topic of challenges in tracking diseases over a widely dispersed geographic area. We refer those interested in a deeper treatment of the topic to the provided citations. No change has been made to the text.
US	EPA	Are the Great Lakes considered marine waters? If not, the phrasing here is likely to be confusing	Ch 5: Water-Related Illness		170	28	The text has been revised to incorporate this suggestion.
US	EPA	Presume the increased illness rates are in humans; coming immediately after the discussion of pathogens in animals, that is not clear.	Ch 5: Water-Related Illness		170	33	The text has been revised to incorporate this suggestion.
US	EPA	"sewage to shellfish" should be "sewage in shellfish"	Ch 5: Water-Related Illness		172	24	The text has been revised to incorporate this suggestion.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
US	EPA	Is this a single instance, or an ongoing phenomenon? As stated, it seems to be a single study. If so, need to be careful to appropriately qualify general conclusions, particularly given the following sentence.	Ch 5: Water-Related Illness		175	8	The text has been revised for clarity.
US	EPA	Does "are important" suggest a worsening or improvement, or simply something that needs to be considered in evaluating possible changes?	Ch 5: Water-Related Illness		175	11	The text has been revised for clarity.
US	EPA	Need to be clear that these factors can individually influence algae - that they do not need to all be present.	Ch 5: Water-Related Illness		175	26	The text has been revised to incorporate this suggestion.
US	EPA	"will" is quite definitive. Is that intentional, or should this be more qualified (e.g., "is expected to")?	Ch 5: Water-Related Illness		176	3	After consideration of this point, we still feel the existing text is clear and accurate. No change has been made to the text.
US	EPA	Global Climate Model should be global climate model (no caps)	Ch 5: Water-Related Illness		176	18	The text has been revised to incorporate this suggestion.
US	EPA	Awkward phrasing. Presume the differences in average consumption is a function of different tribes; if so that should be noted.	Ch 5: Water-Related Illness		178	3	The text has been revised to incorporate this suggestion.
US	EPA	Implies "store-bought" foods are inherently less healthy, which is not the case. Suggest using "prepared" or something similar, or removing the adjective altogether.	Ch 5: Water-Related Illness		178	9	The text has been revised to incorporate this suggestion.
US	EPA	This implies that extreme precipitation and flooding always leads to direct introduction of contaminants and pathogens. Is that true?	Ch 5: Water-Related Illness		182	35	The text has been revised to incorporate this suggestion.
US	EPA	This sentence is hard to follow. It's unclear what the text following the dash refers to. Does "exacerbates" refer to the prior list, only to children, or to cognitive development and maturation (esp. in children)?	Ch 6: Food Safety		220	21	The sentence has been rewritten for clarity.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
US	EPA	The point about the link between CO2-induced reduction in crop quality and nutrition is a bit unclear. Does reduction in crop quality link to nutrition deficits (presumed to be the case)?	Ch 6: Food Safety		221	1	Sentence has been rewritten for clarity.
US	EPA	Seems that the risk from temperature extremes should also be included here, or at least a connection to Chapter 2.	Ch 6: Food Safety		224	22	While extreme temperature is one type of extreme weather event that could result in populations of concern experiencing difficulty accessing safe and nutritious food, other extreme weather types, including storms, floods, fires, etc., could also affect food access. The authors have chosen to keep this sentence broad to incorporate multiple types of extreme weather.
US	EPA	Need to make sure that the message here related to the impacts associated with winter storms is consistent with the message in Chapter 2 regarding the effects of cold weather. It is important to distinguish between large-scale statistically-based estimates of mortality and the effects of event-driven impacts, but to ensure the overall message is consistent across the two chapters.	Ch 7: Extreme Events		254	1	After consideration of this point, we still feel the existing text is clear and accurate. No change has been made to the text. While the chapter on extreme events does not provide numerical estimates of the current or projected health impacts of winter storms, please refer to sections within Temperature-Related Death and Illness chapter, to better understand how an extreme cold event is defined and the different methodological approaches to quantifying the health impacts (i.e., direct attribution or statistical analysis).
US	EPA	Does this still hold following implementation of the ACA?	Ch 7: Extreme Events		255	16	Although this is an interesting question, this statement is based on the best available literature at the time of writing. The authors feel that this statement represents the literature accurately and clearly. No change has been made to the text.
US	EPA	The sentence discusses the social construct, but does not address the physical construct (e.g., condition of housing and other buildings, community infrastructure, etc.).	Ch 7: Extreme Events		255	24	The text has been revised to incorporate this suggestion.
US	EPA	Given the preceding point that we don't know how to quantify the impacts due to complexity, this statement is problematic as written. It essentially says that we don't really know the numbers because the relationships are complicated, but we have strong understanding of the factors. While there may be a solid understanding of what we believe are the key factors that link	Ch 7: Extreme Events		256	1	Due to editing, this text has been moved to the Introduction section and has been revised to incorporate the commenter's suggestion. The Introduction explains why projections of future health burdens due to extreme events under climate change are not available in the

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		extreme events to health risk, it seems to be a stretch to say that we have a "strong" understanding of the subsequent risks of adverse risks as a result of changes in extreme weather and climate.					literature and that the chapter focuses on the physical processes and pathways that scientists know contribute to human exposure to extreme events.
US	EPA	"infrastructure risk" is better stated as "risk to infrastructure"	Ch 7: Extreme Events		256	14	After consideration of this point, we still feel the existing text is clear and accurate. No change has been made to the text.
US	EPA	Reference Ch 4 here.	Ch 7: Extreme Events		256	15	The text has been revised to incorporate this suggestion. However, the authors decided it was not appropriate to reference chapter 4 in this section.
US	EPA	Explain what "epidemic-level" means	Ch 7: Extreme Events		257	38	The discussion of cascading infrastructure failures has been revised to focus solely on the power outage example to address chapter space limitations. The text on the Milwaukee waterborne disease example has been removed and the reader is directed to the Water Related Illness chapter for more information.
US	EPA	Does "increase in temperature" refer to annual average, or other?	Ch 7: Extreme Events		263	33	The text identified by the commenter related to <i>C. gattii</i> has been removed. The authors decided that the text box should focus solely on <i>Coccidioidomycosis</i> as the best example supported by the literature of the potential impact of climate change on fungal disease.
US	EPA	Are wildland fire and wildfire interchangeable, and does this also include intentional fire (e.g., prescribed burning)?	Ch 7: Extreme Events		264	11	We used the two terms "wildland fire" and "wildfire" interchangeably, but the text has been revised to use only one term for clarity ("wildfire"). The glossary term for wildfire indicates that prescribed burning or intentional fires are outside of the scope of section 7.7.
US	EPA	Suggest reversing the order of "hazardous winds" and "precipitation" to be consistent with the following text.	Ch 7: Extreme Events		265	29	Due to editing to address chapter space limitations, this text was removed. The section identifies that the primary health hazards of severe thunderstorms are from lightning and high winds.
US	EPA	Remove comma after lightning	Ch 7: Extreme Events		265	30	The text has been revised to incorporate this suggestion.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
US	EPA	Refer to Ch 8 here	Ch 7: Extreme Events		266	34	The text has been revised to incorporate this suggestion.
US	EPA	Is there nothing associated with the aftermath of Katrina/Rita or Sandy that could be cited here?	Ch 7: Extreme Events		267	5	The text has been revised to incorporate this suggestion.
US	EPA	Revise Table 1, for flooding and other hazards, example health outcomes & symptoms, to include: • Respiratory impacts; • Exacerbations of chronic diseases such as asthma; • Carbon monoxide poisoning	Ch 7: Extreme Events	Table 1	253		The text has been revised to better reflect the body of literature available for impacts within the US.
US	EPA	Add the following to the end of the sentence: "; however, there is a strong body of literature documenting the adverse health effects of dampness and mold in homes (IOM 2004; Mendell et al. 2011; Fisk et al. 2007; Fisk et al. 2010)." The citations for the References section are: IOM, 2004: Damp Indoor Spaces and Health. The National Academies Press, 370 pp. [Available online at http://www.nap.edu/catalog/11011/damp-indoor-spaces-and-health]; Mendell MJ, Mirer AG, Cheung K, Tong M, Douwes J. Respiratory and allergic health effects of dampness, mold, and dampness-related agents: a review of the epidemiologic evidence. Environ Health Perspect 2011;119:748e56.; Fisk WJ, Lei-Gomez Q, Mendell MJ. Meta-analyses of the associations of respiratory health effects with dampness and mold in homes. Indoor Air 2007;17:284e95. ; Fisk WJ, Eliseeva E, Mendell MJ. Association of residential dampness and mold with respiratory tract infections and bronchitis: a meta-analysis. Environ Health 2010;9:72.	Ch 7: Extreme Events		257	29	We have added the suggested citations in our chapter assessment.
US	EPA	There is also a body of literature on the potential for mold in water-damaged homes, for example, as was observed in New Orleans after Hurricanes Katrina and Rita in 2005. It would be appropriate to include a discussion of this in this chapter. Some potential references include: Solomon et al. Airborne Mold and Endotoxin Concentrations in New Orleans, Louisiana, after Flooding, October through November 2005. Environ Health Perspect 114:1381–1386 (2006). doi:10.1289/ehp.9198 ; Centers for Disease Control and Prevention (CDC). Health concerns associated with mold in water-damaged homes after Hurricanes Katrina and Rita--New Orleans area, Louisiana, October 2005. MMWR Morb Mortal Wkly Rep. 2006 Jan 20;55(2):41-4.	Ch 7: Extreme Events		257	29	We have added the suggested journal citation in our chapter assessment, but the authors did not add the CDC reference because we already cite a more recent body literature.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
US	EPA	Revise the central blue pathway, Exposure Pathways to include: • Water damage and mold growth in flooded buildings; Revise the Health Outcomes to include: • Respiratory illness	Ch 7: Extreme Events		290	1	The Exposure Pathways diagram (Figure 2) has not been revised according to this suggestion. The authors' assessment is that the scientific literature is not robust or definitive that flooding will lead to mold growth inside buildings. We have instead acknowledged this topic as a potential health issue in the Infrastructure section.
US	EPA	Need to be consistent in presenting affiliations. Other chapters give only the high level (e.g., Agency, University) affiliations and do not specify the subunits.	Ch 8: Mental Health		294	2	Thank you for your comment. The text has been revised for consistency.
US	EPA	Presume the impact is adverse - should be clear on that point.	Ch 8: Mental Health		295	25	We have revised to clarify the statement.
US	EPA	Was this among veterans who experienced the effects of Katrina first-hand, or among veterans overall?	Ch 8: Mental Health		297	18	Suggestion has been incorporated by clarifying the text.
US	EPA	This is stated as fact, but with no citation. Either needs a citation or some other means to demonstrate how this is known.	Ch 8: Mental Health		298	27	The text has been revised to incorporate the suggestion. The text has been deleted.
US	EPA	This citation is nearly 20 years old. Although this may be a foundational study, it should be reinforced with more recent data.	Ch 8: Mental Health		300	2	The authors have added a more recent publication.
US	EPA	This is a repeat from the previous paragraph.	Ch 8: Mental Health		300	10	We appreciate that this error was pointed out and have made the appropriate correction.
US	EPA	"if poor air quality conditions worsen" - is it only worsening of already poor air quality, or does this also apply to worsening from fair or good air quality?	Ch 8: Mental Health		308	21	The authors appreciate the comment. The text has been revised for clarity.
US	EPA	What about those in poverty as a population of concern. This is noted throughout, and is explicitly discussed later in the chapter, but is not identified or quantified here. The same is true for children and older adults.	Ch 9: Populations of Concern		341	26	Section 9.4.1 already addresses health impacts related to people living in poverty. Sections 9.4.3 and 9.4.4 already address children and older adults.
US	EPA	Is there a reason for the order in which these are presented? It would be good to note if there is. If not, suggest using alphabetical ordering.	Ch 9: Populations of Concern		341	27	We appreciate this suggestion, but the author team has deliberated and agreed on maintaining the current order of the sections for readability and flow of the chapter.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
US	EPA	What about age?	Ch 9: Populations of Concern		342	2	The commenter does not provide a suggested change or edit.
US	EPA	Are access and affordability the only barriers? Are there cultural attitudes that come into play?	Ch 9: Populations of Concern		343	21	The text has been revised to clarify that barriers in access and affordability of mental health care are some of the factors contributing to mental health impacts.
US	EPA	There seems to be a mismatch in the age ranges, and a clear difference between what is stated here and what is stated on pp. 360-361. It is unclear whether the 2-17 age range and the infancy to 18 age range are compatible (did children 2-17 yrs old experience a disaster before the age of 2?). In the Traceable Accounts section, it states that 10% of these children are expected to experience a disaster over their lifetimes, not simply within their childhoods.	Ch 9: Populations of Concern		346	7	Text in both the chapter and the Traceable Accounts has been revised for clarity and accuracy with regard to the findings of the cited study. The revised sentence reflects that the study presents survey results and does not make climate projections.
US	EPA	This needs context. This, and the previous statistic (7 million children suffer from asthma) would suggest that, on average, children with asthma miss 1 1/2 days of school each year. Is this a lot? How does this compare with other causes of absence? How many missed school days are there per year?	Ch 9: Populations of Concern		346	22	The text has been revised to incorporate this suggested language.
US	EPA	Is the stated temperature increase for peak temperatures, peaks during a heat wave, annual daily average? Needs clarification.	Ch 9: Populations of Concern		349	26	The text has been revised to clarify.
US	EPA	Is this consistent with the point about acclimatization to increasing temperatures made in Ch. 2? Are there differences in the ability to acclimate among older adults?	Ch 9: Populations of Concern		349	26	We find that the discussion of extreme heat and older adults in this chapter is simply citing published studies of impacts of past heat events on the elderly, which is consistent with the Temperature-Related Death and Illness chapter. Text has been added to this Chapter to address this comment. Acclimatization to increased temperatures may occur among older adults and other vulnerable groups, but this point does not contradict the observed vulnerabilities of older adults to heat events.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
US	EPA	Need to be consistent with Ch 3 regarding the level of certainty regarding the relationship between climate change and PM. The earlier discussion was considerably less definitive than is suggested here.	Ch 9: Populations of Concern		350	4	The sentence cross-references the Air Quality Impacts chapter and uses qualifying language that does not imply a definitive projection. No changes have been made.
US	EPA	The data need to be updated to 2010. The percent increase is also in error - it's presumed this was intended to note that Florida's percentage of older adults was 4 percentage points higher, not 4% higher. The 2010 data show that Florida's older population percentage is 4.3 percentage points higher than the national average (17.3% vs. 13.0%). It is actually more appropriate to compare Florida's percentage to that of the rest of the nation without Florida, in which case the difference is 17.3% vs. 12.8% - 4.5 percentage points and about 36% higher. See "The Older Population: 2010" C2010BR-09, Nov. 2010, C.A. Werner, Bureau of the Census	Ch 9: Populations of Concern		350	22	We have clarified the text related to Florida's percentage of older adults as compared to the national average and added the following citation: Werner, CA. 2010. The Older Population: 2010. C2010BR-09, Nov. 2010, U.S. Bureau of the Census.
US	EPA	Seems that a better term than "workforce" could be used here when referring to the military.	Ch 9: Populations of Concern		352	38	The text box has been substantially revised for readability and to better reflect current publications of health risks. The term in question has been replaced.
US	EPA	It is worth noting that members of the military tend to be in generally better physical condition and younger than the population at large. Even though the military is often deployed into situations that present greater hazards (even aside from conflict) than those faced by most people, the fact that they are affected by these illnesses and injuries demonstrates that it is not only those who we usually consider to be most vulnerable who are at risk.	Ch 9: Populations of Concern		353	4	We appreciate this suggestion, but space is limited. The author team has deliberated and agreed on the most important information and illustrations to include.
US	EPA	The dates for which the unemployment statistics apply need to be provided, given significant fluctuations of unemployment rate over time.	Ch 9: Populations of Concern		353	33	The text has been revised to incorporate this suggestion.
US	EPA	Note comment regarding p. 346/7 - difference in period over which children are expected to experience a disaster.	Ch 9: Populations of Concern		360	35	Text in both the chapter and the Traceable Accounts has been revised for clarity and accuracy with regard to the findings of the cited study.
US	EPA	"Global Climate Models" should not be capitalized	App 1 (Ch 10): Technical Support		391	36	The text has been revised.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
			Document				
US	EPA	Suggest clarifying by "the modeled century"	App 1 (Ch 10): Technical Support Document		392	32	The text has been revised
US	EPA	"can effectively account" is better characterized as "can more effectively account"	App 1 (Ch 10): Technical Support Document		395	6	The text has been revised to incorporate this suggestion.
US	EPA	Add that crops have potential of contamination that will increase risk of human exposure. Nb tomato contamination by use of contaminated water.	Executive Summary		11	29	No text has been changed in the executive summary, as space is limited and the executive summary is meant to be a high level summary of the report. Please find additional information on this topic in the chapter on Food Safety.
US	EPA	Can the models be explained somewhere?	Executive Summary		6	7	No text has been changed in the executive summary, as space is limited and the executive summary is meant to be a high level summary of the report. Please see the Technical Support Document (Appendix).
US	EPA	Are there are few aspects of climate change that we can include that particularly make it harder to reduce ozone? Like rising temperatures, more stagnation? When using the words climate change its helpful to always give an idea of what aspects of climate change are causing the impacts of concern. Its a very vague term.	Executive Summary		7	12	Please find information on this topic in the chapter on air quality impacts. The entire report has been reviewed to ensure consistent terminology when using the terms climate, climate change, climate related, and climate variability.
US	EPA	An example would be helpful.	Executive Summary		9	32	All Key findings have been reviewed and revised. However, please see the underlying chapters (in this case the chapter on vectorborne disease) for more specific information and examples.
US	EPA	In terms of a secondary impact, are there concerns or research about increased pesticide use to control mosquito populations?	Executive Summary		9	23	Please see the chapter on Food Safety for information on changes in pesticide use and associated health impacts.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		Mosquito control companies are becoming more popular in suburban residential areas.					
US	EPA	The term "climate" is used in different ways throughout. In some cases, it's used as shorthand for "climate change," and in other ways as a shorthand for "climate change impacts." The authors should review these different uses throughout the document to ensure consistent and appropriate use.					The authors appreciate this comment and the report has been reviewed to ensure proper terminology throughout the chapters.
US	EPA	It is clear that the chapters have been developed independently of one another. There are, however, numerous opportunities to consider the health impacts of multiple exposures or stressors. As an example, the risks to ag workers include heat and potentially increased exposure to pesticides. These are treated as independent stressors and there is no venue here for addressing the combinations.					<p>Though chapters were developed by independent author teams, multiple workshops were held with all the authors to talk about cross-cutting issues and ensure consistency across the report. The report was also reviewed by the Steering Committee and an independent National Academies of Science National Research Council peer review panel.</p> <p>The impact of heat on agricultural workers is discussed in the chapter on Populations of Concern. Pesticide impacts on agricultural workers is discussed in the chapter on Food Safety, Nutrition, and Distribution. The author team has agreed on the most important information/illustrations to include for this graphic. Cumulative and cascading impacts are outside the scope of this report. Additional information on this important topic has been added to the Front Matter to acknowledge that many of the impacts described throughout the report do not act in isolation from one another.</p>
US	EPA	The health impacts of climate change are presented as a major public health threat, but the projected mortality levels are actually quite modest in comparison to other causes of death. "Tens of thousands" of deaths is certainly nontrivial, but that's the same order of magnitude as suicide or falls. This does not mean that the health impacts of climate change are minimal, but it is important not to overstate the relative magnitude of what we can now quantify. The challenge is to present what can confidently be quantified in a way that does not overstate the near-term impacts,					The authors agree that the severity of impacts needs to be discussed in the appropriate context and the report has been reviewed to consider where clarification was needed on this subject. The authors appreciate this constructive comment.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		but to also make people aware of the need to understand that conditions will become tremendously worse in the long term.					
US	EPA	The reality of faster changing Arctic impacts deserves special mention in the Executive Summary and Elsewhere in Report. The current and potential health impacts described are presented as those which happen and/or are expected to happen across the board generally in the US. No regional perspectives are offered - maps presented include neither Alaska nor Hawaii. While the discussion in chapter 9 of vulnerable populations does devote a few sentences to impacts on Alaskan native Americans (p. 343, line 30-34), in most discussions, it generally lumps these groups in with others from "the lower 48." It fails to note that global change in Alaska and in the Arctic is reportedly taking place at a 2X rate greater than the "lower 48." Recommend consideration be given to providing more discussion of how climate change is affecting/is expected to affect human health in different regions, specifically the Arctic.					This figure has been modified in both the underlying chapter and the executive summary. Global change in Alaska and the Arctic is taking place at a 2X rate greater than the "lower 48." We have included a brief discussion in the Indigenous Peoples section to better describe Alaskan Natives' vulnerability.
Wendy	Ring	Wildfires can contribute significantly to ozone. see Jaffe, 2013 Impact of Wildfires on Ozone Exceptional Events in the Western US, Environ Sci Technol, 2013, (47)11065-11072	Ch 3: Air Quality				We agree, and address this point in box 1
Wendy	Ring	Chronic dust exposure from drying saline lakes such as Owens and Mono Lakes in California deserve mention. They are major sources of airborne arsenic, which is a cause of lung cancer.	Ch 3: Air Quality				The points the comment raises are beyond the scope of this chapter/report.
Wendy	Ring	Autochthonous Chagas disease is a vector borne disease which appears to be creeping over the US Mexico border. Field studies in recent years show that triatomines are found around human habitation in CA and AZ and that about half have recently fed on humans. Serosurveys of dogs in animal shelters in TX show show Biting frequency increases with temperatures. Carcavallo, R. Climatic factors related to Chagas Disease transmission Mem. Inst. Oswaldo Cruz, 94(1), 1999	Ch 4: Vectorborne Diseases				The approach and organization of this chapter was decided after conducting a comprehensive literature review. Two case studies, Lyme disease and West Nile virus, were chosen as representative examples of vectorborne diseases in the United States for this chapter because of their high incidence rates and the body of literature available on the association between climatic and meteorological variables and occurrence of these diseases. Other vectorborne diseases may emerge or re-emerge as public health threats, but factors in addition to climate change are likely to be significant drivers of their emergence. Because of this, a discussion of emerging or re-emerging diseases was not a priority for this chapter. Notably,

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		Garcia, M. Potential novel risk factors for autochthonous and sylvatic transmission of human Chagas disease in the US. Parasit Vectors 2014; 7:311 Stevens, L. Vector blood meals and Chagas transmission potential United States; Emerging Infectious Diseases April 2012					compared with human outcomes (disease), a vast amount of literature is available on meteorological and climatic influences on vectors. As a result, our certainty in how climate change is likely to influence the vectors far exceeds our certainty in how changing climatic conditions are likely to affect when, where and how many cases of vectorborne diseases are likely to occur.
Wendy	Ring	There is some evidence and a scientific basis for oxidation of naturally occurring arsenic in aquifers to the more toxic and water soluble arsenite in when the water table drops due to drought related heavy pumping of groundwater. There are many agricultural areas in the US which already have arsenic contamination of groundwater and also overdrawn aquifers. Change in arsenic concentration in well water in these areas should be an additional area of research.	Ch 5: Water-Related Illness				The author team has deliberated and agreed on the most important information and illustrations to include to best reflect the literature available for climate change impacts to groundwater in the US. The chapter has been edited to include some summary information regarding the health implications of drought-related impacts to groundwater quality and supply, as well as human response to drought (water reuse and overdrawing aquifers). The chapter has not been revised to include discussion of arsenic in groundwater because there is very little peer-reviewed scientific literature on the relationship between arsenic, groundwater, and climate change. Based on our review of the literature and consultation with groundwater experts, this potential route for contamination may only occur in unique, site-specific conditions with particular soil chemistry; thus, we do not find that this issue is likely to become a significant public health issue in the United States that would warrant inclusion in a national level assessment.
Wendy Marie	Thomas	Add "also" between 'can' and 'cause'. The "also" denotes the additional impacts of extremes and transitions from the human to infrastructure side.	Ch 7: Extreme Events		252	11	Due to several rounds of editing of the Key Findings for readability and to better reflect the underlying literature, the text has been removed and the comment is no longer relevant.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
Wendy Marie	Thomas	Where is Figure 1's image?	Ch 7: Extreme Events		252	24	All figures are at the end of the document.
Wendy Marie	Thomas	<p>The proceeding sentence references "some minority" and "low-income populations". It is unclear, therefore, how the "African American populations" are being defined in the follow up sentence -- as a minority group or as a low-income population.</p> <p>While it's generally understood that minorities are more likely economically disadvantaged than ethnic majority, it's important to be clear that the US Government is not implying that the entire African-American population is also low-income, as these sentences imply together imply -- or leave open to interpretation.</p> <p>That said, ln 29 may want to say "For example, [low income] African-Americans ..."</p> <p>I recommend</p>	Ch 7: Extreme Events		255	29	The text has been revised to incorporate this suggestion.
Wendy Marie	Thomas	<p>This sentence presents an opportunity to elaborate and educate others on why it is bad policy or choice to "assume stable weather patterns".</p> <p>Here's why, and a possible addition...</p> <p>"The atmospheric system is inherently dynamic and changing, with or without human interference."</p>	Ch 7: Extreme Events		256	11	The text has not been revised in this way. Due to space limitations, this section focuses on broad trends for infrastructure and the section already clearly identifies that shifts in the frequency or intensity of extreme events outside their historical range pose infrastructure risks.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
Wendy Marie	Thomas	Delete "the frequency or intensity of extreme events" and replace with "climate". Reason: It truncates the sentence, and keeps the attention focused on climate as the reason.	Ch 7: Extreme Events		256	13	We appreciate this suggestion; however, the authors feel that the existing text is clear and accurate. No change has been made to the text.
Wendy Marie	Thomas	Important to add that the 2003 blackout also lead to food borne illness impacts, pest-control issues, and vaccine spoilage. You may want to reference: Public Health Rep. 2006 Jan-Feb; 121(1): 36–44. PMCID: PMC1497795 Blackout of 2003: Public Health Effects and Emergency Response Mark E Beatty, MD, MPH, FAAP,a,b Scot Phelps, JD, MPH,a Chris Rohner, MUP,a and Isaac Weisfuse, MD, MPH http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1497795/	Ch 7: Extreme Events		258	1	Thank you for the suggestion. The text has been revised to incorporate this suggestion.
Wendy Marie	Thomas	Prefer a consistent use of racial terms. Replace "black" with African-American in Ln 14, and "white" with Caucasian in Ln 15.	Ch 7: Extreme Events		260	14	The text has been revised to maintain consistency with the Style Guide for the report. We use terminology for race that is consistent with the U.S. Census Bureau, which uses "Black" and "White" as its primary terms. We use both terms "Black or African American" the first time they are mentioned in the chapter, but "Black" thereafter.
Wendy Marie	Thomas	Replace "health" hazards with "safety" hazards as what follows more directly speaks to safety-related hazards.	Ch 7: Extreme Events		260	34	The authors have decided to remove the subsection on hurricane wind hazards to better reflect the state of the scientific literature and to address chapter space limitations. Thus, the

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
							suggested clarifications were not made as they are no longer relevant.
Wendy Marie	Thomas	<p>Need to define "social systems" as its a new term in this chapter.</p> <p>Overall the sentence to define "resilience" is confusing.</p> <p>The part "while maintaining the capacity" may be better summed up as "while having either the physical, mental or financial capacity to move on or forward--this includes adaptation and learning."</p>	Ch 9: Populations of Concern		338	30	Wording changes have been made to better define and illustrate resilience.
Wendy Marie	Thomas	What about adding "construction workers"?	Ch 9: Populations of Concern		339	26	The text has been revised to include this suggestion in the list of exposed workers. We also note other groups exposed to extreme indoor heat conditions, such as workers in warehouses, steel mills, manufacturing facilities, etc.
Wendy Marie	Thomas	<p>Be consistent in how the report mentions Blacks or African-Americans.</p> <p>The proceeding chapters uses "African-American"</p> <p>Also, when all of the other groups start with a capital letter it's only polite to use the word that can also capitalized this marginalized group.</p>	Ch 9: Populations of Concern		341	27	The chapter follows the report's Style Guide for consistent usage of race and ethnicity terms, which is consistent with the applications of terms in the U.S. Census.
Wendy Marie	Thomas	This section presupposes that though the demographics will change the economic distribution will remain the same. If this is accurate, it will help to state so or to provide statistics.	Ch 9: Populations of Concern		341	26	No change has been made to the text because the discussion of changes in demographics (such as age and gender and race/ethnic distributions) is simply citing published projections. Given methodological challenges, there are no projections of future changes in economic distribution (i.e., household incomes) that would be appropriate to cite in this section.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
Wendy Marie	Thomas	NWS' Director has been interested in "extreme cold temperature" impacts. Building off the UKMet Office's work and parts of the northern US, there is evidence to suggest that low income and homeless individuals are highly vulnerable to this weather extreme. As a USG report, I'd like to see this assessment to also address "extreme cold temperatures"	Ch 9: Populations of Concern		342	6	We appreciate the suggestion, but space is limited and we do not cover this issue in this chapter. Extreme cold temperature impacts are addressed in the Temperature Extremes chapter. In addition, the Extreme Events chapter discusses the vulnerability of low income and homeless people to health impacts associated with winter storms.
Wendy Marie	Thomas	While I appreciate this being a summary document, I'd like to see the addition of Tornadoes. Tornadoes have a devastating health and health care infrastructure impact.	Ch 9: Populations of Concern		342	16	Tornado occurrence is not definitively related to a changing climate and is not addressed in this report (see Extreme Events chapter for more explanation of coverage of topics).
Wendy Marie	Thomas	This needs a causation. Consider adding "lacking pest-control" here... "...socioeconomic factors, lacking pest-control, some..."	Ch 9: Populations of Concern		343	8	The text has been revised to incorporate this suggestion.
Wendy Marie	Thomas	I have a significant concern with this statement, which I've seen also in the general media. "Populations of color and low-income [DELETE populations] are more likely to be affected because they spend a relatively larger portion of their household income on food than more affluent households." Isn't it more fair to say, and also a better understanding, to say that pops of color and low-income spend more per capita (than a percentage...that should be a non-sequitor).	Ch 9: Populations of Concern		343	13	After consideration of this point, we still feel the existing text is clear and accurate.
Wendy Marie	Thomas	ADD "overall" "A number of [ADD overall] health risks are higher..."	Ch 9: Populations of Concern		343	24	After consideration of this point, we still feel the existing text is clear and accurate.
Wendy Marie	Thomas	Fishes --> fish	Ch 9: Populations of Concern		343	35	The text has been revised to incorporate this suggestion.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
Wendy Marie	Thomas	Is the statistics "more than 10% of children are expected to experience a disaster in their lifetime" ...relative to what climate baseline? Does this stat include a climate-based projection, like out to 2040? If so, that would be good to add.	Ch 9: Populations of Concern		361	1	Text in both the chapter and the Traceable Accounts has been revised for clarity and accuracy with regard to the findings of the cited study. The revised sentence reflects that the study presents survey results and does not make climate projections.
Wendy Marie	Thomas	In text and in graph... "social vulnerability index" needs to be more defined than "overall" as it's hard for me to comprehend this. Overall would entail economic, weather, etc... that seems like a complex statistic. The zero population areas are obviously National Parks. It might be helpful to mention it in the caption.	Ch 9: Populations of Concern	4	388		Due to the size of the topic, and the page limit for the chapter, we focused on broad trends for the topic of vulnerability mapping. We refer those interested in a deeper treatment of social vulnerability indices to the provided citations.
Wendy Marie	Thomas	I am sure others have noted the same... the text did not survive the formatting hurdle.	Ch 9: Populations of Concern	1	385		The text has been reformatted.
Wendy Marie	Thomas	As with Figure 1, the text here did not survive the formatting hurdle.	Ch 9: Populations of Concern	2	386		The text has been reformatted.
Wendy Marie	Thomas	The report talks about immigrants and Native Americans, the former are not Americans. My suggestion is to replace "American people" with "national population" to be more inclusive. The aforementioned groups will also fall into these categories.	Executive Summary		2	2	Thank you for your comment but the authors have decided to leave this term in as it relates to the audience for the report and is consistent with the 2014 National Climate Assessment language.
Tyra	Bryant-Stephens	page 91- move line 34-38 to line 5 providing more description on how ozone impacts health -page 94 line 34-35- Not really true, it is poor, minority communities who bear the brunt of asthma disease	Ch 3: Air Quality				Regarding comment 1: after considering this point, we believe the text is clear and accurate. Regarding comment 2: Many minority communities will possess these same attributes, and so we believe the existing text is both clear and accurate. Regarding comment 3: we believe the existing

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>-page 96, line 26- should add exposure to diesel exhaust from traffic related air pollution potentiates sensitivity to ragweed.</p> <p>-page 99 starting at line 37 to page 100 through line 10. Would replace with the following up to date information.</p> <p>Ten million children have been diagnosed with asthma, 7 million children currently have asthma.1 Non-Hispanic black children are more likely to ever have been diagnosed with asthma or currently have asthma than Hispanic or white children. Blacks have 60% higher asthma prevalence rate.2 Among Hispanics, Puerto Rican children bear a disproportionate asthma burden with asthma prevalence higher among persons of Puerto Rican (16.1%) than Mexican (5.4%) descent.3 Blacks are 2.5 times more likely to be admitted to the emergency room and hospital and 3 times more likely to die from asthma. Asthma death rates per 1,000 persons with asthma were 75% higher for Black children.1 Compared to other groups, Hispanics are less likely to be insured, less able to navigate the healthcare system, and less able to communicate with and understand their healthcare provider. This leads to fewer preventive visits, delays in seeking care for acute illness and subsequent increased emergency room visits and hospitalizations than whites.4,5,6 Asthma is the most common cause for missed school days and parent work days. Sleepless nights result in reduced school performance and may also impact the child’s ability to learn.7,8</p> <p>1. Akinbami, Lara J et al. “Trends in Asthma Prevalence, Health Care Use, and Mortality in the United States, 2001-2010.” NCHS data brief 94 (2012): 1–8. Print.</p> <p>2. Akinbami, Lara J, Julia C Rhodes, and Marielena Lara. “Racial and Ethnic Differences in Asthma Diagnosis Among Children Who Wheeze.” <i>Pediatrics</i> 115.5 (2005): 1254–1260.</p> <p>3. Lara, Marielena et al. “Heterogeneity of Childhood Asthma Among Hispanic Children: Puerto Rican Children Bear a Disproportionate Burden.” <i>Pediatrics</i> 117.1 (2006): 43–53.</p>					<p>text is accurate.</p> <p>Regarding comment 4: Constraints regarding both the scope and length of the chapter prevent us from incorporating all of this information. Thank you for suggesting the references. We incorporated the citation to Akinbami et al. 2012.</p>

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>4. Law, Huay-Zong, Emeka Oraka, and David M Mannino. “The Role of Income in Reducing Racial and Ethnic Disparities in Emergency Room and Urgent Care Center Visits for asthma-United States, 2001-2009.” The Journal of asthma: official journal of the Association for the Care of Asthma 48.4 (2011): 405–413.</p> <p>5. Chang, Jongwha et al. “Disparities in Health Care Utilization Among Latino Children Suffering from Asthma in California.” Pediatric Health, Medicine and Therapeutics (2011): 1. CrossRef</p> <p>6. Stingone, Jeanette A, and Luz Claudio. “Disparities in the Use of Urgent Health Care Services Among Asthmatic Children.” Annals of allergy, asthma & immunology: official publication of the American College of Allergy, Asthma, & Immunology 97.2 (2006): 244–250.</p> <p>7. Daniel, Lauren C et al. “Missed Sleep and Asthma Morbidity in Urban Children.” Annals of allergy, asthma & immunology: official publication of the American College of Allergy, Asthma, & Immunology 109.1 (2012): 41–46.</p> <p>8. Expert Panel Report 3: Guidelines for the Diagnosis and Management of Asthma - Asthgdln.pdf.” Web. Accessed 16 Sept. 2013.</p>					
Tyra	Bryant-Stephens	I think this is a very important chapter on vulnerable populations that should be placed as chapter 2, not chapter 9.	Ch 9: Populations of Concern				We appreciate the suggestion, but upon discussion, we conclude that the current placement of this chapter is optimal for summary and conclusory purposes.
Tyra	Bryant-Stephens	I believe that the report is supported by and captures most of the latest science as well as the understanding of specific effects upon children. However, in various sections of the report more information is warranted.					<p>We greatly appreciate your positive comment about our report and hope that you find the content useful.</p> <p>Regarding comments pertaining to the Populations of Concern chapter, we believe that we have captured the literature on pregnant women and fetal exposure. We have revised</p>

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>I recommend more specific mentions of pregnant women, fetal exposure, and children as vulnerable populations throughout the document.</p> <p>Throughout the report there is a reference to “age” being a factor in vulnerability, but this reference can be vague. In each section, it should be specifically spelled which ages are most vulnerable for which exposure. Moreover, throughout the report there is imprecise and inconsistent use of terms to describe “child” populations of concern.</p> <p>Given relatively new understandings about environmental effects on reproduction, the Report might suggest the need for research about the effects of climate change on, for example, epigenetics, gametogenesis, conception, prenatal development, and/or postnatal development.</p> <p>Climate change will affect the nation’s 130,000 schools and the 55 million children they serve every school day. To protect the health of these children—especially children who live in poverty—schools will need to purposefully assess and mitigate in their own respective locations climate-change-induced: temperature-related illness and death, poor air quality, vector borne disease, food safety, water, extreme weather (witness recent storm-related destruction, dislocation, and costs), and mental health problems. New research suggests that increases in room temperature may impair math performance (many U.S. schools lack adequate ventilation or air conditioning). In addition, the nation’s schools already are being asked to educate the next generation about climate change; and, possibly, with the release of this Report, the health effects of climate change. Further, the United Kingdom has developed a strategic plan for that nation’s schools to help reduce</p>					<p>the text to add more detail where it is possible to do so – there remains a research need.</p> <p>We believe that we have spelled out how age is a factor in determining vulnerability. We write extensively on age as an important non-climate stressor. Our focus has been on the most vulnerable age groups: young children and older adults. Where age plays a role in determining vulnerability, we have noted that.</p> <p>We agree that we can ask for more research on reproductive health and climate change.</p> <p>As indicated in an earlier response, we agree that the environmental quality of all settings where children spend time (homes, child care centers and schools) is critical to determine their exposures. We have added language to describe children’s greater vulnerability than adults to some environmental exposures, especially in school buildings or child care facilities where they spend the majority of their time outside of the home. In addition, schools are mentioned as one of the factors that contribute to exposure in Section 9.3.3, particularly if in a risk-prone location.</p> <p>Similarly, we have addressed issues related to respective locations of residence or activities to determine climate change-related exposures for school age children.</p> <p>The suggested citations are not from the peer-reviewed scientific literature. We have not chosen to include these citations because we feel the current references are more appropriate and adequate given the chapter’s space limitations.</p>

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>the release of carbon. Given the influence of climate-change on our nation’s schools and school children, and the reciprocal potential of schools to educate and redress the causes and impacts of climate-change, EPA Administrator McCarthy might consider carefully planned and strategic EPA and US Department of Education interagency discussions. [Note: I’ve pasted below a few illustrative publications.]</p> <p>Education Sector Responses to Climate Change http://unesdoc.unesco.org/images/0021/002153/215305e.pdf</p> <p>Temperature and Human Capital in the Short- and Long-Run http://www.nber.org/papers/w21157</p> <p>Hurricanes Katrina and Rita: The School Impact http://www.edweek.org/ew/collections/hurricane-katrina/</p> <p>Climate Change Education in the Formal K-12 Setting: Lessons Learned from Environmental Education http://sites.nationalacademies.org/cs/groups/dbassesite/documents/webpage/dbasse_072565.pdf</p> <p>Climate Change—What You Can Do: At School http://www.epa.gov/climatechange/wycd/school.html</p> <p>Climate Change Debate: Coming Soon to A School Near You</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>http://www.usnews.com/news/articles/2014/06/20/how-the-climate-change-debate-is-influencing-whats-taught-in-schools</p> <p>Climate Change and Schools: A Carbon Management Strategy for the School Sector [in the UK]</p> <p>http://webarchive.nationalarchives.gov.uk/20130401151715/http://www.education.gov.uk/publications/eOrderingDownload/DCSF-00366-2010.pdf</p> <p>Arizona Heat Illness Prevention School Project. http://www.azdhs.gov/phs/oeh/extreme/heat/schools.php</p>					
Justin	G.	Many examples of "climate-related disasters" seem instead to be "weather-related disasters." Please explain the meaning of a "climate-related disaster" and why it's a better term for "weather-related disasters." These terms also seem to be used interchangeably throughout the chapter, which I'd advise against.	Ch 8: Mental Health				We thank you for your comment and the text has been updated to include both climate- and weather-related disasters.
Justin	G.	Formatting of bibliographic entries are not consistent (e.g. some report titles are italicized whereas others aren't, some URLs are provided in addition to dois and some aren't, the first letter of titles is capitalized for some reports but not others...)	Ch 8: Mental Health				We appreciate this comment and attention to detail. The references have been edited for consistency.
Justin	G.	If something is a climate-related event, how can something follow it? Do the authors mean "weather-related" event here?	Ch 8: Mental Health		295	10	Thank you for the comment and thoughtful review. We have revised the statement to be grammatically correct.
Justin	G.	The use of the term "virtually" means that not all Americans are exposed to the thread of climate change. Which ones are not exposed? Where do they live?	Ch 8: Mental Health		295	19	Thank you for your thoughtful comment. We have revised the text.
Justin	G.	Which multimedia coverage unequivocally attribute specific events to climate change? Scientists are still divided on this issue.	Ch 8: Mental Health		295	20	Thank you for your comment. The text has been revised.
Justin	G.	Possible grammatical mistake: "are an integral part" -> "are integral parts."	Ch 8: Mental Health		295	31	The text has been revised to incorporate this suggestion.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
Justin	G.	The last portion of this sentence reads awkwardly.	Ch 8: Mental Health		295	31	The text has been revised to incorporate this suggestion.
Justin	G.	The link between climate change an conflict has been discussed with articles supporting both the existence an absence of such associations. I'd remove the discussion that here since articles rejecting the link are not cited in these couple of lines.	Ch 8: Mental Health		296	1	Interpersonal violence and group conflict have been removed from the sentence.
Justin	G.	Is it the threat of climate change per se or the threat of the manifestations of climate change (e.g. more extreme weather?)	Ch 8: Mental Health		296	15	The text has been revised to clarify.
Justin	G.	What is added by including "individual" in this sentence? I think the sentence reads better by just mentioning societal.	Ch 8: Mental Health		296	27	After consideration of this point, we still feel the existing text is clear and accurate; we believe that there is a distinction between individual and societal health and the chapter addresses both.
Justin	G.	What does a "significant symptom" mean?	Ch 8: Mental Health		296	37	The text has been revised to incorporate this suggestion.
Justin	G.	This discussion seems out of place, and is only a one-sentence paragraph.	Ch 8: Mental Health		297	10	We have incorporated the suggestion.
Justin	G.	Why are "adults" singled out here, since children are generally not first responders?	Ch 8: Mental Health		297	30	Suggestion has been incorporated.
Justin	G.	What is the baseline for this comparison? i.e. increases in interpersonal violence relative those prior to the onset of the extreme event? Or, increases relative to those normally experience had an extreme event not occurred? Would the alcohol abuse and partner violence occurred anyway in the absence of extreme events?	Ch 8: Mental Health		297	32	The suggestion has been incorporated by clarifying the text.
Justin	G.	What are the biological reasons for the increased incidences of suicide? Which physiological responses are triggered by such extreme events?	Ch 8: Mental Health		298	1	Due to the size of the topic, and the page limit for the chapter, we focused on broad trends rather than delving too deeply or providing such a level of specificity.
Justin	G.	Please clarify the meaning of this sentence. Do you mean that the rate of homicide-suicides in the six months post Hurricane Andrew was double that which occurred over the previous five years? I	Ch 8: Mental Health		298	2	The suggestion has been incorporated by clarifying the text.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		believe an identical six-month comparison period would be more appropriate.					
Justin	G.	Why aren't these responses also true of events hitting rural areas?	Ch 8: Mental Health		298	13	The suggestion has been incorporated by revising the text.
Justin	G.	Why aren't these responses also true of events hitting rural areas?	Ch 8: Mental Health		298	13	The suggestion has been incorporated by revising the text.
Justin	G.	The authors might wish to mention the stress on the power grid here.	Ch 8: Mental Health		298	20	While the comment suggests a good specific example, the authors feel the existing examples are appropriate and adequate given space limitations and scope of the chapter.
Justin	G.	Actually, the entire US has experienced drought.	Ch 8: Mental Health		298	26	The suggestion has been incorporated by clarifying the text.
Justin	G.	Why doesn't this sentence appear earlier in the chapter, as it is a very seminal point?	Ch 8: Mental Health		299	3	We appreciate the thoughtful comment. We agree that this is a very important issue, but believe it is in the right place given the organization of the chapter.
Justin	G.	It would be interesting if literature on denial--as a response to climate change impacts--exists.	Ch 8: Mental Health		299	1	We appreciate this suggestion, but space is limited. The author team has deliberated and agreed on the most important information to include.
Justin	G.	This portion oversimplifies the literature, as other articles reach opposite conclusions.	Ch 8: Mental Health		299	18	We have revised text for better clarity.
Justin	G.	This is a very interesting point, and I am wondering why individuals with mental illness are extremely vulnerable. Is it due to a lack of support structures? It's unfortunate that no attempt to explain why this is the case appears in this paragraph.	Ch 8: Mental Health		299	22	While the comment has good questions, the authors feel that these questions have been answered in the following paragraph as well as additional sections throughout the chapter.
Justin	G.	Could the same be said about extremely cold temperatures?	Ch 8: Mental Health		299	36	The authors appreciate the question, however this section is focused on heat and therefore the discussion is limited to this scope.
Justin	G.	What is meant by a "hotter city?" Is this a function of the changes brought on by climate change? I believe other factors may be involved, and indeed, only one article is cited for this point. Also,	Ch 8: Mental Health		300	3	We thank you for your comment and appreciate the observation. The sentence has been removed.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		what is a "city?" Which density is necessary? I'd remove this sentence.					
Justin	G.	This portion oversimplifies the literature, as other articles reach opposite conclusions.	Ch 8: Mental Health		300	7	We have revised text for better clarity.
Justin	G.	Do the authors suggest that meteorological drought could decrease the frequency of interpersonal violence?	Ch 8: Mental Health		300	10	After consideration of this point, the authors feel that the existing text is clear and accurate.
Justin	G.	Are these the only two examples?	Ch 8: Mental Health		300	15	Thank you for your comment, the text has been updated to better clarify that West Nile virus and Lyme disease are two examples of vectorborne illnesses.
Justin	G.	Please clarify the added value of this paragraph. It implies that adaptation efforts to the expansion of lyme and WNV due to climate change are inadequate (e.g. lack of ability to diagnose due to unfamiliarity in certain geographical areas). Am I understanding it correctly?	Ch 8: Mental Health		300	24	The authors feel that the text is clear and accurate as is.
Justin	G.	I'd remove the period that appears before the citations as one follows the citations anyway.	Ch 8: Mental Health		301	9	Change made, period removed.
Justin	G.	I suggest adding more to this one-sentence paragraph.	Ch 8: Mental Health		301	7	We appreciate this suggestion, but space is limited. The author team has deliberated and agreed on the most important information and illustrations to include.
Justin	G.	Are people afraid of climate change per se or of the impacts of it?	Ch 8: Mental Health		301	12	The text has been revised to incorporate this suggestion.
Justin	G.	I believe this portion over-generalizes.	Ch 8: Mental Health		302	14	Due to the size of the topic, and the page limit for the chapter, we focused on broad trends rather than delving too deeply or providing such a level of specificity. After consideration of this point, we still feel the existing text is clear and accurate.
Justin	G.	Interesting discussion. I am wondering whether people recognize that the biological response is indeed rooted in something called climate change.	Ch 8: Mental Health		303	18	We appreciate your comment however, this comment does not seem to suggest any revision.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
Justin	G.	Missing a word at the beginning of the line.	Ch 8: Mental Health		303	33	We have reviewed and do not find any missing words.
Justin	G.	I've never seen the "h" in "hurricane Katrina" lower-cased. See line 32 on pp. 305 where the "h" is capitalized.	Ch 8: Mental Health		303	36	We appreciate the comment and have made the suggested correction.
Justin	G.	Has anyone responded through denial?	Ch 8: Mental Health		304	18	We appreciate the suggestion and have deliberated and due to size of the topic of the chapter and that space is limited, the suggestion is beyond the scope that we can cover.
Justin	G.	I'm curious as to what "long-term" means given that the impacts of climate change occur over the long-term anyway. Interesting point though.	Ch 8: Mental Health		309	24	Suggestion incorporated by revising text.
Justin	G.	This sentence reads like a policy recommendation.	Ch 8: Mental Health		309	26	Suggestion incorporated by clarifying text.
Justin	G.	This chapter hasn't established the "unprecedented environmental stressor." Climate changes have occurred previously (e.g. Little Ice Age). I suggest rephrasing to emphasize the anthropogenic nature of this climate change if one wants to establish the unprecedented nature of the stressor.	Ch 8: Mental Health		314	1	Edit made to incorporate this perspective.
Justin	G.	Do the impacts of climate change include really cold areas becoming massive heat-spots? What about areas that will be warmer but still on the cooler side? Also, has the amount of heat expected in certain areas under climate change been factored into all the studies cited? i.e. is there a threshold or tipping point beyond which the cited studies are no longer applicable because of the increases in heat due to climate change (e.g. exceeds boundary conditions)? In other words, if the case studies in the literature end at 40.5 degrees C, causing the sentence on lines 14-18 to be true, but climate change results in temperatures of 46.5 degrees C, is this sentence still true?	Ch 8: Mental Health		307	14	After consideration of this point, we still feel the existing text is clear and accurate. The statement that use of certain medications leads to increased susceptibility to heat is independent of geographic variability of temperature changes. Chapter 1 includes projections of US temperature. Regarding tipping points, for the most part, the available data spans a sufficiently wide variation of temperature.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
Justin	G.	Please explain the meaning of "virtual."	Ch 8: Mental Health		307	31	Thank you for the comment. The term is defined in text; the author team feels that the definition in text is sufficient.
Justin	G.	Good point.	Ch 8: Mental Health		308	8	Thank you for your positive comment. The authors appreciate hearing the positive comments.
Justin	G.	Seems to seriously over-generalize, as indigenous populations are not homogeneous.	Ch 8: Mental Health		308	22	We appreciate the comment but feel that the text is clear and accurate for the scope and page limit of the chapter.
Justin	G.	Interesting point, and I would like to see the reason for this statement explicitly stated.	Ch 8: Mental Health		308	32	The authors appreciate the comment and the text has been revised. The authors refer those interested in more information to read the food safety chapter. Due to the page limit of this chapter we cannot delve deeper into this specific issue.
Justin	G.	Typo in city name	Ch 8: Mental Health		322	34	Typo has been corrected.
Justin	G.	This article has a doi. See: http://dx.doi.org/10.1037/0022-006X.64.4.712 doi listed on page at: http://psycnet.apa.org/journals/ccp/64/4/712/	Ch 8: Mental Health		323	27	The text has been revised to incorporate this suggestion.
Justin	G.	Better to link to the article's digital object identifier (doi): 10.1007/978-3-319-05266-3 than to the URL provided here.	Ch 8: Mental Health		325	4	The text has been revised to incorporate this suggestion.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
Justin	G.	<p>This article has a digital object identifier (doi):</p> <p>10.1521/psyc.65.3.207.20173</p> <p>Also, the journal title here is incomplete. It should be:</p> <p>Psychiatry: Interpersonal and Biological Processes</p> <p>See: http://guilfordjournals.com/loi/psyc</p>	Ch 8: Mental Health		326	4	The text has been revised to incorporate these suggestions.
Justin	G.	<p>The journal title here is incomplete. It should be:</p> <p>Psychiatry: Interpersonal and Biological Processes</p> <p>See: http://guilfordjournals.com/loi/psyc</p>	Ch 8: Mental Health		328	14	The text has been revised to incorporate this suggestion.
Justin	G.	I see the journal abbreviation is used. Most everywhere else in the chapter, the entire journal title is used. I suggest keeping it consistent.	Ch 8: Mental Health		329	8	The text has been revised to incorporate this suggestion.
Justin	G.	<p>This article has a digital object identifier (doi):</p> <p>10.1017/S1049023X00007020</p> <p>See:</p> <p>http://journals.cambridge.org/action/displayIssue?decade=2000&jid=PDM&volumeId=24&issueId=04&iid=8260649</p>	Ch 8: Mental Health		329	24	Suggestion: The text has been revised to incorporate this suggestion. (Additional explanation as needed.)
Justin	G.	Don't need a URL if a doi is present. Common practice in this chapter seems to be the omission of a URL when a doi is present.	Ch 8: Mental Health		330	1	The text has been revised to incorporate this suggestion.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
Justin	G.	This article has a digital object identifier (doi): 10.1002/jts.2490090305 See: http://onlinelibrary.wiley.com/doi/10.1002/jts.2490090305/abstract	Ch 8: Mental Health		330	33	The text has been revised to incorporate this suggestion.
Justin	G.	Don't need a URL if a doi is present. Common practice in this chapter seems to be the omission of a URL when a doi is present.	Ch 8: Mental Health		331	31	The text has been revised to incorporate this suggestion.
Justin	G.	Need place of publication	Ch 8: Mental Health		331	38	Place of publication has been added (New York).
Justin	G.	This chapter focuses a lot on heat, but what about extreme cold spells which are still expected to occur (albeit less frequently as heat waves)?	Ch 8: Mental Health				We appreciate your comment, but space is limited. The author team has deliberated and agreed on the most important information and illustrations to include.
Justin	G.	I'd be very interested in more discussion of the biological/physiological underpinnings of the various mental-health relate responses presented here.	Ch 8: Mental Health				We thank you for your comment but due to page limit and scope of the chapter we did not include this is the chapter.
Justin	G.	The discussions of the link between climate change and violence (albeit incomplete in their own right) are repeated multiple times throughout the chapter. I suggest reorganizing.	Ch 8: Mental Health				We thank you for the comment and observation. We have discussed this concern and decided to maintain the current organization of the document as it was deliberately organized to address issues related to different climate risks. This may result in some similar discussions of mental health and wellness outcomes where risks have similar outcomes.
Justin	G.	I recommend rephrasing the caption as those without color printers would not be able to associate the colors with parts.	Ch 8: Mental Health	1	333		Thanks for your comment; references to color have been removed from the caption.
Justin	G.	Suggest rephrasing the title unless the figure is intended to be a surrogate for the entire chapter. Otherwise, why read the chapter? Also, is the impact identical across all communities? I therefore suggest prefixing "impact" with something.	Ch 8: Mental Health	2	334		The Figure 2 title has been revised to incorporate this perspective. Regarding impact across communities, we appreciate the suggestion, but space is limited. The author

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
							team has deliberated and agreed on the most important information/illustrations to include.
Justin	G.	The literature is divided concerning the existence of a link between climate change and violence/aggression. I therefore suggesting removing these points, or rephrasing the figure title so as not to indicate that the link is definite.	Ch 8: Mental Health	2	334		We thank you for your comment but after the authors deliberated we feel that based on the available and best science the graphic is clear and accurate as is.
Mike	Montgomery	Good summary. Update it as more information is added or changed in the final version, hopefully with hyperlinks to make moving through the document faster.	Executive Summary				We greatly appreciate your positive comment about our report and hope that you find the content useful. The final version of the report will be available online (with links) and as a printable pdf.
Mike	Montgomery	<p>Suggested improvements which may already be planned:</p> <p>Provide hyper links in the final digital version for contents, key words, that can take the reader to the first page of discussion of that topic or later even to the data that resulted in the conclusions offered.</p> <p>Summary deals with health topics but not all infrastructure impacts. Example: South central Canada and North Central US States experienced less snow but more wind and colder temperatures driving frost depths and corresponding damage to new damaging low levels underground.</p> <p>It would appear that not only are extreme events causing new flooding at greater levels suggesting new flood plain maps in Texas and other states may need to be redrawn with evaluation of evacuation corridors, better warning systems, and other improvements where affected. Determine new construction criteria / codes in various regions to accomodate on going subsidence from ground water pumping, frost depth considerations as well as mitigation of frost or freeze damage to exisiting buried utilities where expense to dig and lower is unaffordable, but other means may be insulate or prevent freeze damage in specific areas.</p> <p>As long as the winter Low pressure systems continue to want to center more closely to Hudson Bay, dip to the Great Lakes then oscillate toward Greenland or variations of that instead of the now missing Arctic Ice, cold fronts may continue to surprise city</p>	Executive Summary				The final version of the report will be available online (with links) and as a printable pdf. As noted, many secondary or cumulative impacts, including those on infrastructure, is beyond the scope of this report. The front matter of the report includes a brief section describing and noting the importance of topics beyond the scope of this report, including cumulative impacts. Policy issues, including building regulations or standards, are beyond the defined scope of the Climate and Health Assessment, a scientific document that provides the basis for decision making, but does not address policy nor make policy recommendations.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>planners and utility system managers by causing major damage or expense previously unplanned as with Buffalo NY, Boston, where buildings collapse while transportation is parallized with no rapid means to restore movement of critical equipment saving people and buildings.</p> <p>This in turn suggests that after every major extreme event where people are displaced, injured, killed with extreme dollar consequences, the agencies contributing to this report should update documents with recommendations how to better anticipate these events (that may become more frequent) in the regions affected.</p>					
Mike	Montgomery	<p>Air quaility is a major concern of mine. While all of the chapters are doing a good job trying to cover everthing that ocured to the authors, I never see this topic discussed and think needs to be considered.</p> <p>Major cities and some other areas have large contributions of pollutants, CO2, Methane, and other hopefully measured gases and particulates. What I don't see is the percentages in the air of these, including oxygen, in order for the readers to note whether their percentage of oxygen in their areas may be less than they've been told exists. I've often been told that O2 never changes its percentage (wrong), and someone is always measuring that, but I never see where that's measured, how, and what was measured when; which could be another contributor to brain function and health declining due to Oxygen's percentage being crowed out of the proper ratio for humans and animals. You may think I'm crazy, but this ought to be checked at various levels vertically in cities and near natural gas and oil or chemical producing facilities as well as very large feed lots.</p> <p>Lastly, years ago a program entitled "Global Dim" was broadcast that illustrated the long history of pan evaporation rates, tracked over many decades if not centuries, have been dropping because of the haze in our atmosphere preventing even more evaporation of oceans and other water bodies to generate even more rain producing weather. It was shown those evaporation rates were better in the planets southern regions then; but may no longer be the case now with all the trees being burned in more areas. Which</p>	Ch 3: Air Quality				We appreciate this suggestion, but space is limited. The author team has deliberated and agreed on the most important information and illustrations to include.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>brings me to discussions of creative responses to recreate this process.</p> <p>There could be suggested technology improvements, grants to produce equipment or other devices that could be used where needed to add moisture to our atmosphere upwind from areas that are becoming more arid from our oceans. Other technologies developed for better equipment to filter all pollutants from outside air brought in to our homes or businesses, than exists today.</p> <p>We need to foster creative ways to develop the next decades technologies to deal with an ever worsening problem that most can still afford to buy and use.</p>					
Mike	Montgomery	<p>Our country is famous for letting markets decide what to grow, when, then deliver; but, today California is using a gallon of water for each almond grown that could have gone to a more efficient food product to feed people. As long as other areas not as affected by depleted water resources continue to demand these kinds of food products we need to consider where and what needs to be grown for the efficiency for that specific water resource. Not a central planning process, but instead, encourage modification of California law that allows unregulated use of aquifer water without regard to how much the aquifer can be depleted. Encourage more local gardens and small green house or in home gardens for food production. Assist in the development of new technologies that would be as useful in the homes and businesses in cities and suburbs as in the poor countries even worse off than California, Syria, Iraq, Egypt, Libya, and many other countries. This should include ways to harvest moisture from the wind that goes directly to these home grown "gardens".</p> <p>Regarding the commercial sized farms and producers, the transportation of their products to market was terrible until recently only because the oil production declined freeing up more train cars to deliver farmers goods to market. The locks on the Mississippi are terrible and need to be improved allowing larger barge traffic to move through without using as much river water in the process. As long as farmers must store their grains locally with no way to move</p>	Ch 6: Food Safety				Thank you for your comments and suggestions. However, these are related to policy recommendations and adaptation, and thus are beyond the defined scope of this report.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>it at the right time efficiently, the risk to the quality of the food produced and only stored sometimes for many months, increases.</p> <p>Combine efforts like this or new ones not yet thought of with a mechanized or more simple supplemental "increased pan evaporative processes" that could emerge providing more moisture if not rain that could be feeding these gardens. For discussion of pan evaporation rates, google "Global Dim" and watch the program here: http://www.pbs.org/wgbh/nova/sun/</p> <p>Then consider ideas like having a few weeks twice a year, one in heat of summer and coldest winter, where no planes fly except for emergencies and the worst polluting industries minimize their polluting exhaust, or even shut down for those weeks or days determined. Not only could better maintenance be provided on these systems during the down time; but people might be inclined to change how they travel or vacation. You'd be surprised how clear the sky will get, how bright the stars are at night, and maybe, temporarily we'll see pan evaporation rates increase, while winter temps drop even more, and summer temps rise as well. Then maybe understanding the solutions might be more widespread. Anyone that remembers what the sky was like after the planes were grounded soon after the tragedy of 911 will understand the implications.</p> <p>In addition, there should be a discussion of science denial in a way that is illuminating and educational, not confrontational, so more will come to understand when they're seeing "weapons of mass distraction", a phrase made more famous by a NASA science education rep Michelle Fowler who can be watched here: http://www.c-span.org/video/?324922-2/discussion-science-skeptics. MICHELLE FOWLER is an ASTRONOMER AND</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>SCIENCE COMMUNICATOR who speaks first after the moderator introduces all four presenters in the video.</p> <p>Lastly on the topic of food, there is not enough science in the effects of GMO's to match the science that creates them or the chemicals used on these foods that were designed specifically to grow with the specific chemicals used to prevent fungal or weed infestations the affects on us long term remain unknown. GMO's deserve to exist as a market as much as non-GMO's and organic foods do, but the latter two can be overwhelmed by the GMO producers and this should be studied as well as Lead was in gasoline, or paint was or the pollutants in Tobacco. All of which still took decades to finally be rid of them, and our health began to immediately improve. But with our food, if the original food dna has been tampered with, how do we ensure we can go back to the original if that is found to be better AND safer?</p>					
Mike	Montgomery	<p>This is a great start! Something you might want to consider in future projection models of how temperatures, precipitation or air quality might be more extreme is to describe the variables that cause the future models to deviate, sometimes wildly from the averages that may be projected. No one expected this much rain in May 2015 in Texas or other nearby states. None of the future models developed project these kinds of extreme events; but if the city and state planners don't get a model that describes events like this they won't develop any mitigating features to make it easier for their citizens evacuate, be better forewarned, or even decide if they want to live in certain areas of our country.</p> <p>This document could be a starting point to inspire extreme creativity by our citizens to develop means to mitigate the extremes of climate change and future affects on all of us. Without exploring all the possible solutions being yet to be discussed with the corresponding costs and time to implement, how else is anyone going to be inspired to think outside the box for planet saving solutions?</p>					<p>We greatly appreciate your positive comment. The physical scientific basis behind climate change, including future projections and uncertainty, is discussed in the third National Climate Assessment (NCA3). However, there is a summary of observed and projected impacts in The Introduction chapter. There is discussion of uncertainty in the Front Matter, the Introduction chapter and also in the appendix on Technical Support Document and appendix on likelihood and confidence; however, detailed descriptions of ranges of projected impacts will be found in the underlying citations of the literature assessed in this report.</p>
Mike	Montgomery	In other sections of the document I've commented that policy decisions by states (like California's aquifer's) are still allowing	Ch 1: Preface				Thank you for your comment, however policy issues are beyond the defined scope of the

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		<p>water to be pumped as fast as the farmers can. Today we see an article in the local paper: http://www.washingtonpost.com/national/health-science/how-europes-climate-policies-have-led-to-more-trees-cut-down-in-the-us/2015/06/01/ab1a2d9e-060e-11e5-bc72-f3e16bf50bb6_story.html?wpisrc=nl_headlines&wpmm=1</p> <p>...that wholesale clear cutting of timber and other woody material is being converted to wood chips but all are sent to Europe so they can save their trees. Is this smart policy? While we all know there will be push back from the usual suspects already polarized on many issues; but understanding the importance of trees to our atmosphere and continued existence on this planet, might be pretty important too.</p> <p>Might this document take a separate section to deal with how our national, state, and local policies may need evaluation and revision to have a smarter policy as we move toward what we hope is a better tomorrow?</p>	and Introduction				Climate and Health Assessment, a scientific document that summarizes published literature on health impacts. The report may provide input for decision making, but it does not address policy. Therefore, no text has been added or altered.
Joanna	Podrasky	<p>To Whom It May Concern:</p> <p>I am writing in response to the Environmental Protection Agency's (EPA) request for comments on behalf of the United States Global Change Research Program (USGCRP) on the Draft Impact of Climate Change on Human Health in the United States: A Scientific Assessment. (Federal Register Number 2015-07629)</p> <p>This report provides a valuable overview to inform public health officials, disaster response planners, multi-sector policy and decision makers, and other stakeholders about the risks that climate change presents to human health. In developing a report on the Impact of Climate Change on Human Health in the United States, I applaud USGCRP for including discussion of the data gaps and</p>	Ch 4: Vectorborne Diseases				<p>A discussion of the caveats of Lyme disease surveillance goes beyond the scope of the chapter.</p> <p>Each year, approximately 30,000 cases of Lyme disease are reported to CDC by state health departments and the District of Columbia. However, this number does not reflect every case of Lyme disease that occurs. In fact, the goal of Lyme disease surveillance is not to capture every case, but to systematically gather and analyze public health data in a way that enables public health officials to look for trends and take actions to control or prevent the disease and, thus, improve public health.</p> <p>Following its implementation in 1991, the national surveillance case definition for Lyme disease was modified in 1996 and again in 2008. Changes were generally minor and were meant to strengthen laboratory criteria for</p>

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		<p>uncertainties, however, I suggest adding additional discussion on the following topics to Section 4: Vectorborne Diseases.</p> <p>Impacts of Underreporting</p> <p>Underreporting in health surveillance systems is well-known¹ and causes challenges in utilizing health information as climate indicators.² As noted on Page 2 of the Executive Summary, "...health outcomes differ in terms of whether complete, long-term datasets exist that allow us to quantify observed changes, and whether existing models are able to project impacts at the timescales and geographic scales of interest." However, there is limited discussion about the availability and appropriateness of long-term datasets for each of the health outcomes discussed.</p> <p>Section 4: Vectorborne Diseases lacks adequate background on the reliability and completeness of datasets utilized. Section 4 briefly notes the importance of dataset quality in Section 4.7 on Research Needs and it is also discussed briefly in Section A1.3.2 of the Appendix. Discussion of the data being utilized is important to provide context for the reader. For instance, there were 27,203 confirmed cases of Lyme disease reported in 2013,³ making it the most common VBD in the United States (US).⁴ However, current data collection is anticipated to be vastly underreported with 300,000 cases estimated nationally each year.⁵ The CDC notes that a limitation of Lyme surveillance is that underreporting is likely in areas that are endemic and over-reporting is likely in non-endemic areas.⁶ Using only portion of estimated Lyme disease cases to assess the impact of climate change on incidence of disease may be misconstrued without more thorough discussion.</p>					<p>reporting (i.e., make the case definition more specific and sustainable). These changes may have had some small impact on surveillance which we have considered in interpreting the trends.</p>

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>Section 4 uses the number of probable and confirmed cases of Lyme disease to analyze the effects of climate change. This should be noted in Table 1 in either the headings or as a footnote, allowing the reader to interpret presented numbers accurately. Alternately, if each vectorborne disease reported has different levels of reporting, a note about the differences in availability in incidence data should be included. In addition, it may be valuable for the reader to have information about changes in case definitions. For instance, the Lyme disease case definition was only recently revised in 2008 to include probable cases, which may have an effect on the consistency and completeness of this dataset.⁷</p> <p>Transient Populations</p> <p>Surveillance information relies on the location of residence for reporting health data. This can cause uncertainty in the areas and populations at risk, which is particularly applicable for vectorborne diseases. With populations being transient, even with short-term outdoor activities, the area of infection may be inconsistent with the area of diagnosis. While differences in location are difficult to quantify, brief discussion on this should be included.</p> <p>Key Finding 5 discusses the Emergence of New Vectorborne Pathogens, which notes travel-related exposures. This sections focuses on the emergence or re-emergence of new vectorborne diseases and pathogens, but travel-related exposure should also be discussed in context of current vectorborne disease threats (i.e. Lyme disease and West Nile virus). Travel-related exposure may cause limitations in data collection, reporting, and appropriate modeling assessing the impacts of climate change. For instance, in addition to living in areas that are endemic for Lyme disease, domestic travel to endemic regions can also be a risk factor for</p>					

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		<p>Lyme disease.⁸ While it is not feasible to incorporate travel and exposure location into models, brief discussion about this uncertainty is appropriate in Key Finding 5 or in another section.</p> <p>Needed Improvements & Responsibilities</p> <p>While the focus of this report is to discuss the state of scientific evidence around human health impacts of climate change, there is important utility in exposing the needed improvements around climate and health surveillance. As noted, there are some current gaps in knowledge and challenges in use of health surveillance data in assessing the impacts of climate change. Since this report is aimed, in part, for public health professionals, I suggest incorporating information about the important role these individuals play in data quality in the Executive Summary, Appendix, or in a new section.</p> <p>Local public health jurisdictions are at the front line in identifying reportable diseases and may affect data collection and quality. For instance, differences in reporting of Lyme disease cases varies greatly between health jurisdictions.⁹ The majority of reported cases in the United States occur in the Northeast, though expansion of incidence requires all healthcare jurisdictions to be informed. Traditionally, greater understanding of the incidence and trends of Lyme disease allows public health professionals to target prevention efforts through avoiding exposure to ticks and providing timely treatment.¹⁰ However, public health professionals have a growing role in the face of climate change. By increasing understanding about trends in climate change indicators, such as Lyme disease, there are opportunities for public health professionals to become more informed and engaged in ensuring data quality.</p>					

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		<p>Recommendations</p> <p>In summary, I recommend:</p> <ul style="list-style-type: none"> • Improving discussion about the impacts of underreporting on the reliability and comparability of health data used, specifically Lyme disease data in Section 4. • Revising Section 4, Table 1 to clarify inclusion of probable and confirmed cases of Lyme disease in numbers presented. • Adding brief discussion to Key Finding 5 in Section 4 on the impact of travel-related exposure to vectorborne disease and how this affects the use of data. • Adding discussion about the role public health professionals play in the accuracy and reliability of data collection in the Executive Summary, Appendix, or in a new section. <p>I appreciate your consideration of my comments and recommendations.</p> <p>Sincerely,</p> <p>Joanna Podrasky</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>Works Cited</p> <p>1. CDC. "CDC provides estimate of Americans diagnosed with Lyme disease each year." 19 Aug. 2013. Accessed from http://www.cdc.gov/media/releases/2013/p0819-lyme-disease.html.</p> <p>2. English, P., et al. "Environmental Health Indicators of Climate Change for the United States: Findings from the State Environmental Health Indicator Collaborative." Environmental Health Perspectives. 1 Nov. 2009. Accessed from http://ehp.niehs.nih.gov/0900708/.</p> <p>3. CDC. "Lyme Disease Data." 27 Aug. 2014. Accessed from http://www.cdc.gov/lyme/stats/index.html.</p> <p>4. CDC. "Lyme Disease Incidence Rates by State, 2004-2013." 27 Aug. 2014. Accessed from http://www.cdc.gov/lyme/stats/chartstables/incidencebystate.html.</p> <p>5. CDC. "CDC provides estimate of Americans diagnosed with Lyme disease each year." 19 Aug. 2013. Accessed from http://www.cdc.gov/media/releases/2013/p0819-lyme-disease.html.</p>					

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		<p>6. CDC. "Lyme disease surveillance and available data." 4 Mar. 2015. Accessed from http://www.cdc.gov/lyme/stats/survfaq.html.</p> <p>7. CDC. "National Notifiable Disease Surveillance System (NNDSS): Lyme disease (Borrelia burgdorferi)." 3 Feb. 2015. Accessed from http://wwwn.cdc.gov/NNDSS/script/casedef.aspx?CondYrID=751&DatePub=2008-01-01.</p> <p>8. American Academy of Pediatrics. "Prevention of Lyme Disease." 1 Jan. 2000. Accessed from http://pediatrics.aappublications.org/content/105/1/142.full.</p> <p>9. Waller, L., et al. "Spatio-temporal patterns in county-level incidence and reporting of Lyme disease in the northeastern United States, 1990–2000." Environmental and Ecological Statistics. Mar. 2007. Accessed from http://link.springer.com/article/10.1007/s10651-006-0002-z#page-1.</p> <p>10. CDC. MMWR. "Surveillance for Lyme Disease - United States, 1992 - 2006." 24. Sept. 2008. Accessed from http://www.cdc.gov/mmwr/preview/mmwrhtml/ss5710a1.htm.</p>					
William	Fisk	For balance, at some location the Executive Summary should communicate that climate change is expected to reduce some adverse health effects, particularly cold-related health effects.	Executive Summary				The authors have considered potential benefits to health of climate change. This point is communicated in the Front matter. The example the commenter suggests can be found

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
							in the Key Findings and underlying text of the chapter on Temperature Extremes.
William	Fisk	The chapter should communicate that climate change will indirectly affect health, both positively and negatively, because climate change mitigation and adaptation measures , particularly changes made to buildings, will modify pollutant and heat exposures.	Executive Summary				The authors have considered potential benefits to health of climate change. This point is communicated in the Front matter. The assessment does not include detailed discussions of climate mitigation, adaptation, or economic valuation. Consideration of greenhouse gas emissions pathways and human adaptive capacity (see Front Matter and Introduction chapter) has been included as appropriate to assess projected climate impacts on human health.
William	Fisk	In Figure ES1 and the similar figures that follow , "Exposure Pathways" is not an ideal category heading label. For example, in Figure ES1, Extreme Heat and Poor Air quality are exposure parameters, not pathways to exposure. Perhaps Exposure pathways should be " Changes in Exposures" and the items in the list be expressed as the types of exposures that change such as heat, pollutants, infectious agents, etc. The figures also do not do a good job of communicating that people are, most often, not directly exposed to the outdoor environment, because they are indoors, and that many factors influence how changes in outdoor environmental conditions affect actual exposures. Finally, the large potential influence of climate change mitigation and adaption measures on exposures and health are not communicated in the figure. I realize that the report does not focus on mitigation and adaptation, but in a diagram designed to communicate basic concepts, the important role of mitigation and adaptation measures in climate-related health effects needs to be clearly communicated.	Executive Summary	ES1	4		This figure, and all the exposure pathway figures, have been extensively revised. The format, style, and titles of the boxes have been revised. In addition, information on how to read/use these diagrams has been added to the Front Matter. A description of adaptive capacity and how it has been described in this report, has been added to the Front Matter, and the preface further clarifies the scope of this report, which does not include adaptation or mitigation. The figure in the Executive Summary and Introduction chapter is not comprehensive, but meant to be an overview of the findings of other chapters. For more information on indoor air quality, see the chapter on Air Quality Impacts.
William	Fisk	The figure or caption should communicate the baseline year or years, for example the changes in death in 2030 are relative to what year.	Executive Summary	ES2	6		The caption for Figure 4 in Temperature-Related Death and Illness chapter has been revised. The text in the executive summary is amended from the findings of the underlying chapter.
William	Fisk	The figure of caption should communicate the baseline or reference year or period.	Executive Summary	ES3	8		The text in the executive summary caption has been revised to include the baseline year.

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William	Fisk	<p>While the to this section introduction does, in general, an excellent job of communicating the complexity of this issue, it fails to adequately communicate that people are, by and large, not exposed to outdoor thermal conditions because they are indoors 90% of the time. The prior research has related morbidity and mortality to metrics of heat outdoors that are not representative of most people's exposures to heat. This misrepresentation of exposure, and failure to account for how building features and building use affect heat exposure, are a potential large source of error in projections of how climate-related changes in temperature will affect health.</p> <p>Additionally, the research needs identified in this chapter should include research on means to better represent people's actual exposures to heat, which will require new metrics of exposure.</p>	Ch 2: Temperat ure- Related Impacts				The text has been edited to address differences between measured temperatures and human exposure.
William	Fisk	I am not sure if any analyses have been performed, but the combination of an aging population, increased periods of extreme heat, and the risk of power failures (caused by or coincidental to periods of extreme heat) would seem to be a source of concern that should be mentioned.	Ch 2: Temperat ure- Related Impacts				Issues regarding older adults are covered in Ch. 9. The risk of power failures are already mentioned in the chapter. No change has been made to the text.
Sarah	Zerbonne	<p>To: U.S. Global Change Research Program (USGCRP) Interagency Group on Climate Change and Human Health (CCHHG)</p> <p>From: Sarah Zerbonne, Graduate Student, The George Washington University</p> <p>Public comment addressing: The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment</p> <p>(http://www.globalchange.gov/health-assessment):</p> <ul style="list-style-type: none"> • Executive Summary • Chapter 1: Climate Change and Human Health 					We greatly appreciate your positive comment about our report and hope that you find the content useful. The intended audience is noted in the preface of the report. The assessment is indeed an update from the NCA3, and provides much more detail than the chapter on Human Health in the NCA3 was able to do, based on space limitations. This is communicated in the Front Matter as part of the value of this report.

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		<p>• Chapter 5: Water-Related Illness</p> <p>My name is Sarah Zerbonne, and I am a graduate student at The George Washington University Milken Institute School of Public Health in the Environmental Health Science & Policy program. I reviewed the U.S. Global Change Research Program (USGCRP) draft report entitled The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment (released for draft public comment on April 7, 2015). This comment will focus primarily on the Executive Summary of the report, as well as portions of Chapter 1: Climate Change and Human Health, and Chapter 5: Water-Related Illness. I have several comments, both positive and constructive, and will provide them in order of how they appear in the chapters.</p> <p>My first comment is that, based upon the Executive Summary, it is unclear who the intended audience is for this document. Although the target audience is stated in the Introductory Chapter of the Assessment (public health officials, urban planners, decision-makers, etc.), it seems important to include this information in the Executive Summary. Because readers are often inclined to read the Executive Summary first before digging deeper into specific chapters, they may be confused about the nature of the intended audience of the Assessment. Unlike the 2014 National Climate Assessment (NCA) (http://nca2014.globalchange.gov/), some of the language in this draft report is at a higher reading level and is geared more toward professionals in the field rather than the general public (example: p. 2, line 31-34).</p> <p>I found that Figure ES1 on p. 4 of the Executive Summary (and on p. 48 in Chapter 1) was well-designed, differentiating between “climate drivers,” “exposure pathways,” and “health outcomes.”</p>					

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		<p>The distinction between these concepts is often unclear in climate change literature, resulting in confusion regarding the association between primary, secondary, and tertiary impacts of climate change. I feel this diagram is valuable in that it illustrates these distinctions (e.g. the differentiation between increasing temperatures as a climate driver, reduced air quality as the exposure pathway, and increased respiratory illness as the health outcome), as well as highlighting external factors that are not necessarily driven by climate change, but still affect vulnerability to health impacts from a changing climate.</p> <p>I feel that Key Finding 2 on p. 5, line 25 is a very important point to highlight. The fact that “mortality effects are...seen for smaller deviations of even a few degrees from seasonal averages” is quite notable, especially because “small deviations from average temperature occur much more frequently than extreme events.” It is important to emphasize that even small changes in temperature can have a significant impact on public health, especially to audiences that may believe human health impacts will not be felt until we experience dramatic temperature changes far into the future.</p> <p>On p. 6, Figure ES2 displays data using two climate models (GFDL-CM3 and MIROC5). Nowhere in the Executive Summary are these two models referenced or explained. Although the models are referenced in the Temperature-Related Death & Illness chapter (Chapter 2), I feel the figure may confuse readers who only look at the Executive Summary. I think it would be useful to either use the full caption that is used under the figure in Chapter 2, or specifically reference Chapter 2 where an explanation of the models can be found in detail.</p>					

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		<p>Figure ES5 on p. 12 of the Executive Summary (and on p. 203 in Chapter 5) is improperly labeled. The title of the figure is “Links between Climate Change, Water Quantity and Quality, and Human Exposure to Water-related Illness.” Unlike line 29 on p.11, as well as line 29 on p. 166 of the Assessment, which use the phrase “Agents of Water-related Illness,” the figure title does not mention the word “agent.” This is misleading because humans are not exposed to “water-related illness,” but rather are exposed to “agents” such as pathogens, bacteria, etc. that can cause a “water-related illness.” In addition to that change, I think this figure would benefit from a clearer link to human exposure. Although the image includes a few small beachgoers (and possibly some swimmers, though it is difficult to tell based on the graphic quality), I think it would be advantageous to more clearly emphasize the potential human exposure within the graphic (e.g. clearer images of people swimming in the water or someone drinking the water).</p> <p>Figure ES6 on p. 14 of the Executive Summary may also benefit from some adjustments. To begin with, I believe the title, “Farm to Table,” may not be the best choice for the figure. Although the title is technically appropriate, I feel the phrase “farm-to-table” is commonly associated with the “sustainable food movement” that focuses on producing and delivering local food to nearby consumers. Depending on the audience, I think it is possible that the figure may mislead the reader or elicit a different response than intended. In addition, I feel the image displays the water body in a way such that it appears higher in elevation than the farm, which may downplay the connection between agricultural runoff leaching into waterways downstream.</p> <p>In Figure ES8 on p. 18 of the Executive Summary (and p. 334 in the full report), the phrase “Climate Impact” is used when describing things like heat, wildfire, sea-level rise, drought, etc. It is unclear why the term “impact” is used as opposed to the term “driver,” which is used in Figure ES1 (as previously mentioned). I</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>think the Assessment would benefit from the use of consistent terminology, especially when it comes to differentiating between drivers, exposure pathways, outcomes, etc.</p> <p>In Chapter 5 on p. 173, line 15, it states that “impacts [from Vibrio] are currently estimated to exceed \$250 million.” There is no time unit associated with that dollar amount, and it is unclear if it is an annual figure or some other timeframe.</p> <p>My final comment is in regards to differentiating the USGCRP Climate and Health Assessment from the Human Health Chapter of the 2014 NCA (Chapter 9) (http://nca2014.globalchange.gov/highlights/report-findings/human-health). My concern is how USGCRP intends to distinguish between the two documents in order to increase exposure to the Climate and Health Assessment. It is obvious that the new Climate and Health Assessment has a significant amount of updated and compelling data that continue to link climate change impacts to public health. I believe it will be important to market the new report in a way that differentiates it from the aforementioned chapter of the NCA, highlighting the vast amount of data, figures, and information that bring to light the significant impact of a changing climate on human health.</p>					
William	Fisk	The figure or caption should communicate the reference year, changes are relative to what year?	Ch 3: Air Quality	2	118		We revised the figure title to reflect this comment.
William	Fisk	<p>The figure of figure caption should communicate the reference year, these are changes in premature deaths in 2025 to 2035 relative to deaths in year xxxx.</p> <p>Also, the text above the figure should refer to the range of estimated CHANGE in ozone-related premature deaths, i.e., insert the word "change".</p>	Ch 3: Air Quality	3	119		We believe the figure title is both clear and accurate.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
William	Fisk	The text on exposure to wildfire pollutants should mention that people are usually indoors and that features of buildings, subject to change, will influence peoples exposure to, and health effects from, wildfire pollutants. See Fisk Building and Environment 86: 70-80 (2015) for related information. The research needs should include research on how mitigation actions in buildings can reduce the adverse health consequences of wildfires.	Ch 7: Extreme Events		264		The points the comment raises is beyond the scope of this chapter. No change has been made to the text.
William	Fisk	The text uses the phrase "mixing of outdoor and indoor air" to refer to building ventilation, however, Mixing may be interpreted by many as the rate of mixing/stirring of air that is indoors or outdoors. It would be better to use a traditional term such as ventilation or air exchange, and provide a phrase to explain the process.	Ch 3: Air Quality		96		After consideration of this point, we still feel the existing text is clear and accurate.
William	Fisk	<p>In section 3.5.2, I suggest addition of a paragraph on how of building energy efficiency implemented to help mitigate climate change may influence indoor air quality and health. Building envelope tightening will modify ventilation rates and affect pollutant exposures as indicated previously in the chapter. Building energy efficiency measures may also reduce the effectiveness of air conditioning systems in controlling humidity, which in turn will affect indoor air quality. In well insulated buildings, thermal loads will be diminished and air conditioners may not operate for a sufficient period to control indoor humidity. In turn, dust mite levels and mold problems, and associated health effects could increase. However, we lack related empirical data on how energy efficiency affects indoor humidity and health.</p> <p>Here are papers that address how changes in residential ventilation rates affect health</p> <p>Oie et al. (Norway) Epidemiology 1999 10(3): 294-299</p> <p>Low VR not directly associated with bronchial obstruction, but bronchial obstruction more strongly associated with dampness in homes with low VR</p> <p>Bornehag et al. Indoor Air 2005 15 (4) 275-280</p>	Ch 3: Air Quality		98		We appreciate this suggestion, but space is limited and the points the commenter raises are beyond the scope of this chapter/report.

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		<p>In homes with low VR (0.05 to 0.24 ach), children had ~ twice as many allergic symptoms, OR = 1.95 (0.94 – 4.04)</p> <p>Emenius et al. Indoor Air 2004 14 (1): 34-42</p> <p>Risk of recurrent wheeze not associated with VR</p> <p>Norback et al. Occup and Envir Med 1995 56(2): 388-395</p> <p>Risk of asthma symptoms increased in homes with high CO2 (P < 0.05), but relied on only 1 hr CO2 measurement [OR = 20 (2.7 – 146) for 1000 ppm increase]</p> <p>Wright et al Allergy 2009 64(11):1671-1680</p> <p>Adding mechanical ventilation (0.5 ach to living room and bedroom) significantly improved peak expiratory flow in evening, but not at morning</p> <p>Lajoie et al. Indoor Air 2014 doi:10.1111/ina.12181.</p> <p>Adding mechanical ventilation (0.17 to 0.34 ach), did not significantly reduce days of asthma symptoms but significantly (by ~ 20%) reduced proportion of children with wheezing</p> <p>Here is a paper on residential envelope tightening, radon exposure, and predicted health effects</p> <p>Milner, J., C. Shrubsole, P. Das, B. Jones, I. Ridley, Z. Chalabi, I. Hamilton, B. Armstrong, M. Davies and P. Wilkinson (2014). "Home energy efficiency and radon related risk of lung cancer: modelling study." BMJ: British Medical Journal 348:f7493.</p>					
William	Fisk	I suggest adding a need for research on how building energy efficiency, particularly in homes, is affected indoor air quality and health. Building energy efficiency is widespread and has	Ch 3: Air Quality		100		The assessment does not include detailed discussions of climate mitigation, adaptation, or economic valuation. Consideration of greenhouse gas emissions pathways and human

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		substantial potential effects on health, yet associated data are extremely sparse.					adaptive capacity has been included as appropriate to assess projected climate impacts on human health.
Bob	Doppelt	<p>ITRC Comments on USGCRP Climate and Health Assessment</p> <p>Chapter 8 Mental Health Impacts</p> <p>(6-1-15)</p> <p>These comments are provided by the 12-person steering committee of the International Transformational Resilience Coalition (ITRC). Website with names of ITRC steering committee members can be found here: http://www.theresourceinnovationgroup.org/transformational-resilience/</p> <p>Overall the draft chapter is a good start of an overview of the mental health impacts of climate disruption. However, we believe it can be strengthened in a number of ways.</p> <p>Specific comments and suggestions:</p> <p>1. Section 8.1 Key Findings and Section 8.3 with the more detailed information mix personal psychological and psychosocial impacts. Although linked, they have profoundly different consequences. The former—increased depression, anxiety, PTSD etc.-- tends to mostly affect the individual, their family, and the mental and physical health care system. The later—rising aggression, crime, violence etc.—affect entire neighborhoods, communities, and regions. Clarifying the differences will help highlight the significance of each type of impact, and make it clear that the</p>	Ch 8: Mental Health				<p>We thank the reviewer for their thoughtful comment. In response to comment #1: we agree that the psychological and psycho-social impacts differ, and also agree that the resulting concerns are all serious (though different). After consideration of this point, we still feel that the text is clear and accurate as is. In response to comment #2 and 3: we appreciate the comments. After consideration of this point, we feel the text is clear and accurate as is on cumulative and chronic stress. This report is scoped to be a current state of the science.</p> <p>In response to comment #4: we agree that not all members of vulnerable populations are inherently at risk as access and functional needs may differ. We have added a caveat to the text to clarify this. Regarding the issues of predicting future climate change outcomes (and interaction of these outcomes) and their potential to result in greater adverse mental health reactions, the points the comment raises are beyond the scope of this chapter. The author team has deliberated and agreed on the most important information to include</p> <p>In response to comment #5: The combination of first responders and emergency workers is a usage often seen in guidance to distinguish that not all response workers will be first responders. We believe the usage is clear and accurate as written.</p> <p>In response to comment #6: we concur that primary prevention can be of value; however, the points the comment raises are beyond the scope of this report. The scope of this report focused on the state of the science related to potential health outcomes of climate change.</p>

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		<p>adverse psychosocial impacts of climate change are not merely personal issues—they threaten the entire nation.</p> <p>2. The document mostly focuses on the direct psychological and psychosocial impacts of climate disruption. However, the impacts of climate disruption go well beyond this to include a boatload of direct and indirect chronic toxic stresses. These range from the psychological and emotional strains resulting from job losses and economic slowdowns, to higher insurance costs, rising food prices due to drought, the pressure of living in a long term drought, and much more. Hopelessness, helplessness, moral distress, and loss of meaning are escalating as people experience feel increasingly powerless to prevent temperatures from rising to levels that produce permanent harm. Emergency responders and other human service workers experience compassion fatigue as they burn out trying to continually respond to a rising number of climate-enhanced disasters. These and many other chronic toxic stresses aggravate many of the existing traumas people experience in their lives, and add their own unique new ones as well. The combo of acute impacts and chronic toxic stresses can have large-scale synergistic negative consequences. Climate disruption should thus be described as a direct source of personal psychological and psychosocial trauma and stress, and as a direct and indirect multiplier of trauma and stress.</p> <p>3. Linked to #1 and #2 above, the chapter comes across as having a somewhat static perspective. That is, it mostly assesses what is known about the adverse psychological and psychosocial impacts, as they exist today. However, it is almost certain that global temperatures have risen by less than half of what will occur in coming decades. The chapter will have an entirely different flavor if it begins with the perspective that a temperature rise of close to 2 degrees C above pre-industrial levels is now very likely—and maybe much more—and then describes what that will likely mean for psychological and psychosocial consequences. For example, the research mentioned that indicates that most people affected by an extreme weather event eventually recover describes the result of one time events that are followed by long periods of stability that</p>					<p>The assessment does not include detailed discussions of climate adaptation. Language on adaptive capacity has been added to the front matter of the report, the introduction to this chapter, and to the resilience section of the chapter.</p>

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		<p>allow people time to recover. However, as temperatures rise toward 2C above preindustrial levels, the combo of extreme weather events and chronic toxic stresses will increase in frequency, intensity, and length, which suggests there will be less and less stability that offers time for recovery. Thus, including research on the adverse psychological and psychosocial impacts of persistent trauma and stress will give a much more accurate picture than merely stating that most people usually recover after a storm, flood, heat wave etc. Said differently, rather than beginning with today's conditions and projecting forward, begin with the reality that temperatures will rise by 2C or more and work backwards from there.</p> <p>4. The discussion about “vulnerable populations” is troubling. While research indicates that in a broad sense some individuals and groups are likely to be more impacted than others by extreme weather events etc., not all people within any of the populations listed will be affected. Many people within each of those groups will not be impacted at all—most likely because they are more resilient than others (e.g. they have good calming and self-regulation skills, strong social support networks etc). Discussing factors that increase vulnerability compared to fostering resilience within each population will give a much more accurate picture than making broad generalized statements about vulnerable populations.</p> <p>Linked to the above, the discussion about vulnerable populations might give the impression that the mental health impacts of climate change are limited to a small subsection of the nation's population. This is not accurate. As global average temperatures rise toward 2 degrees Celsius above pre-industrial levels, the combo of direct and indirect acute and chronic toxic stresses will place anyone without good personal resilience knowledge and skills—female and male, young and old, rich and poor alike—at risk. In addition, by stating that certain populations are more vulnerable than others, mental health agencies are likely to focus their attention and resources exclusively on these groups rather than building</p>					

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		<p>psychological and psychosocial resilience within the entire population. Please note that we are not suggesting that individuals and groups that are likely at greater risk should not be afforded more care. Instead, we are concerned about the possible misimpressions the chapter gives and the resulting policy implications.</p> <p>5. We are unsure of the distinction between emergency workers and first responders. First responders are emergency workers. Is this redundant?</p> <p>6. Finally, following from the above, the document lacks a discussion about interventions that can build psychological and psychosocial resilience—and about the need and benefits of primary prevention in particular. Research shows that psychosocial resilience skills can be taught to youth and adults alike and that people who have these skills are much better able to cope with and respond in constructive ways to acute and chronic adversities. Highlighting the many psychological and psychosocial resilience building programs that exist, as well as the tools and skills that can help build psychological and psychosocial resilience, would fill many gaps in the chapter and make clear that many if not most of the impacts are preventable if building human resilience becomes a national priority.</p>					
Andria	Cimino	<p>The Interagency Crosscutting Group on Climate Change and Human Health (CCHHG)</p> <p>U.S. Global Change Research Program (USGCRP)</p> <p>717 Pennsylvania Ave NW June 4, 2015</p> <p>Washington, DC 20006</p>	Ch 6: Food Safety				<p>Thank you for your positive comments. The authors agree that the issue of biodiversity is of great importance, but find that a discussion of measures to improve or preserve biodiversity is related to policy recommendations, and outside the defined scope of this report. As noted in the introduction, the chapter does not discuss the impacts of climate change on food production or impacts to health of changes in food production, as this is beyond our scope. These topics would be covered in the separate USDA</p>

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		<p>Dear CCHHG Co-chairs,</p> <p>As a graduate student in the Environmental Health Science and Policy track at George Washington University, I am writing in response to the Environmental Protection Agency’s (EPA) request for comments on the document “Draft Impacts of Climate Change on Human Health in the United States: A Scientific Assessment,” which was published on behalf of the USGCRP in the Federal Register on April 7, 2015.</p> <p>First, I wish to applaud the impressive level of teamwork represented by your document. It is of the utmost importance that the many federal agencies with an interest in this urgent topic work together to share and synthesize knowledge, develop new resources for the public, and avoid wasteful duplication of effort toward these and other scientific goals related to climate change (CC) and human health (HH).</p> <p>After searching Chapter 6: Food Safety, Nutrition, and Distribution for the terms biodiversity, pollinators, pollination, and ecosystem services and finding them missing, I decided to draft this comment. I wish to address the importance of biodiversity to U.S. agriculture, how it undergirds food security and the health of all Americans, and how climate change is impacting this nexus.</p> <p>The 1992 U.N. Convention on Biological Diversity defined biodiversity as “the variability among living organisms from all sources including, among others, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are</p>					<p>Food Security Report. A finding from the USDA Food Security Report has also been added to the introduction text to help highlight the importance of this topic while noting it is beyond the scope of this report.</p> <p>References have been provided in the chapter text where more information on production and health can be found. While the chapter does discuss pesticides in general, the amount of literature on health impacts associated with neonicotinoids specifically is, as the commenter acknowledged, sparse, and still emerging. Because of the lack of consensus on toxicity to mammals and the space limitations of this chapter, neonicotinoid impacts were not discussed.</p>

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		<p>part; this includes diversity within species, between species and of ecosystems.”</p> <p>The U.N. Food and Agriculture Organization’s 2008 document, “Climate Change and Biodiversity for Food and Agriculture,” noted it is rare for biodiversity for food and agriculture to be discussed in the same context as CC and was an attempt to do so. It listed ecosystem services provided by agricultural biodiversity that are critical to human health and well-being: food, nutrients, fuel, animal feed, medicines, fibers and cloth, industrial materials, genetic materials, genetic reservoirs, pest resistance and regulation, erosion control, climate regulation, natural hazard regulation, pollination, soil formation, soil protection, nutrient cycling, water cycling, and cultural benefits (I would add mental health benefits as well). It states enhancing ecosystem services through the sustainable use of agricultural biodiversity “will be crucial, given that it contributes to CC adaption, mitigation, and resilience.”</p> <p>Bearing this in mind, I suggest the following:</p> <p>1. Consider including biodiversity either as its own chapter or as part of Ch. 6, where the science concerning its role in agriculture and impact on HH via food security should be highlighted. An important reference to include for continuity would be “The Effects of Climate Change on Agriculture, Land Resources, Water Resources, and Biodiversity in the United States,” a synthesis and assessment report produced by the U.S. Climate Change Science Program in May 2008. Efforts should be made to reference important contributions to the climate change-agriculture-biodiversity-food security-human health literature published since May 2008.</p>					

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		<p>2. Consider including literature on biodiversity friendly agricultural practices and how they offer co-benefits in terms of CC mitigation/adaptation. An excellent review of this topic is available in a recent Institute for European Environmental Policy, “Technology Options for Feeding 10 Billion People—Interactions between Climate Change & Agriculture and Biodiversity & Agriculture.” It references several studies that, although EU-focused, might be useful analogs to fill any gaps in the American science on these topics, as per Suggestion #1 above.</p> <p>3. Consider including literature on the threat of systemic pesticides, in particular neonicotinoids, to biodiversity, food security, and human health given the effects of CC. Although Ch. 6 mentions pesticides in general, the historic level of use of systemic pesticides, especially over the past decade, makes them deserving of special consideration.</p> <p>A large body of evidence now links neonicotinoid use in American agriculture to well-documented declines in pollinator species such as honey and bumble bees. , , , , Further, several recent studies have found even sublethal low-dose exposure to neonicotinoids are harming other beneficial species necessary for arable soil health and natural pest control. , , The overall effect is thought to pose a serious threat to food production in the U.S., ranging from a reduction in the availability, variety, and nutritional quality of certain crops to a crisis in which all pollinated crop yields begin to fall.iv,</p> <p>As this body of research shows, neonicotinoids are persistent and being found in high concentrations where they don’t belong. As noted in Ch. 6, CC, with its more extreme weather patterns and events, is likely to exacerbate all pesticide transport via dust, air,</p>					

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		<p>and precipitation. Given certain fungicides combined with neonicotinoids increases their toxicity by a factor of 200-1000,iv this could result in the creation of pesticide cocktails that are many fold more toxic than each substance alone, to devastating effect.</p> <p>Species already stressed from habitat loss and degradation, parasites and disease, overexploitation and other pollutants are ill equipped to withstand such a direct assault to the immune system.iv, This was the focus of a recent Science article on honeybees,iv and is an example of a growing body of literature with a biodiversity-human health point of view that should be captured by the USGCRP in its current document.</p> <p>The literature also reflects concern in the scientific community about the negative effects neonicotinoids could have on human health. Consensus is growing that the current level of prophylactic neonic use is unsustainable, “a perilous strategy for maintenance of ecosystem services.”xiv Neonic treated seeds, in particular, are seen as “a threat to agrobiodiversity and food security.”xiv</p> <p>Little is known about the role of neonic metabolites in the environment, or how chronic exposure to them via diet may be affecting the health of Americans, particularly more vulnerable populations such as pregnant women, unborn, young children. CC may increase exposure rates. The inclusion of the science to date, even if it is sparse, will serve as an important marker for the multidisciplinary research that is urgently needed to answer questions about the environmental fate of neonicotinoids and their metabolites in conditions mediated by CC.</p>					

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		<p>In conclusion, I offer two quotes that more authoritatively summarize my comment:</p> <p>“There will be rising global demand for food and energy from the land over the coming decades resulting from population growth and economic development. This will coincide with the need to adapt agriculture to increasing climate-related threats... whilst decreasing the impact of agricultural emissions on climate change. At the same time, biodiversity losses due to intensive agricultural practices and abandonment of biodiversity-rich farming are expected to continue. The long-term sustainability of farming is being undermined by trends such as soil degradation, declines in pollinators, the loss of natural biological control of pests and diseases, and the loss of plant and animal genetic diversity. Substantial changes in agricultural systems are required... to ensure rapid reductions in agricultural emissions of greenhouse gases, as well as effective adaptation to climate change and strengthened biodiversity conservation.”</p> <p>—The Institute for European Environmental Policy</p> <p>“We should preserve every scrap of biodiversity as priceless while we learn to use it and come to understand what it means to humanity.”</p> <p>—E. O. Wilson</p>					

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		<p>Sincerely,</p> <p>Andria Cimino</p> <p>References</p> <p>UN Report. Chapter 5: Biodiversity. Available at: http://www.unep.org/geo/pdfs/geo5/GEO5_report_C5.pdf. Accessed on: 04/20/15.</p> <p>U.N. Food and Agriculture Organization. "Climate Change and Biodiversity for Food and Agriculture." February 2008. Available at: http://www.fao.org/uploads/media/FAO_2008a_climate_change_and_biodiversity_02.pdf. Accessed on: 04/20/15.</p> <p>Institute for European Environmental Policy. Technology options for feeding 10 billion people -Interactions between climate change & agriculture and biodiversity & agriculture. Sept. 2013. Available at: http://www.europarl.europa.eu/RegData/etudes/etudes/join/2013/513514/IPOL-JOIN_ET%282013%29513514_EN.pdf. Accessed on: 04/19/15.</p> <p>Goulson D, et al. Bee declines driven by combined stress from parasites, pesticides, and lack of flowers. Science. 27 March 2015, 347(6229).</p> <p>Sanchez-Bayo F. The trouble with neonicotinoids. Science. 14 November 2014, 346(6211).</p> <p>Stokstad E. Pesticides under fire for risks to pollinators. Science. 10 May 2013, 340.</p> <p>van der Sluijs JP, Amaral-Rogers V, Belzunces LP, Bijleveld van</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>Lexmond, M.F.I.J., Bonmatin J, Chagnon M, et al. Conclusions of the Worldwide Integrated Assessment on the risks of neonicotinoids and fipronil to biodiversity and ecosystem functioning. <i>Environ.Sci.Pollut.Res.Int.</i> 2014 10/10.</p> <p>Whitehorn PR, et al. Neonicotinoid pesticide reduces bumble bee colony growth and queen production. <i>Science.</i> 20 April 2012, 336.</p> <p>Krupke CH, Hunt GJ, Eitzer BD, Andino G, Given K. Multiple Routes of Pesticide Exposure for Honey Bees Living Near Agricultural Fields. <i>PLoS ONE</i> 2012 01;7(1):1-8.</p> <p>Gibbons D, Morrissey C, Mineau P. A review of the direct and indirect effects of neonicotinoids and fipronil on vertebrate wildlife. <i>Environ.Sci.Pollut.Res.Int.</i> 2014 06/18.</p> <p>Mariusz Cycoń & Zofia Piotrowska-Seget. Biochemical and microbial soil functioning after application of the insecticide imidacloprid. <i>J Environ Sci.</i> 11 November 2014. doi:10.1016/j.jes.2014.05.034</p> <p>http://www.sciencedirect.com/science/article/pii/S1001074214002010. Available: http://www.farmlandbirds.net/it/content/impact-widely-used-insecticide-soil-microorganisms-nitrifying-and-n2-fixing-bacteria-are-sen/. Accessed: 29 March 2015.</p> <p>Morrissey CA. Neonicotinoid contamination of global surface waters and associated risk to aquatic invertebrates: A review. <i>Environ.Int.</i> 2015-01-01;74:291; 291-303; 303.</p> <p>Pisa LW, et al. Effects of neonicotinoids and fipronil on non-target invertebrates. <i>Environ Sci Pollut Res.</i> 2015; 22:68-102.</p> <p>Chagnon M et al. Risks of large-scale use of systemic insecticides to ecosystem functioning and services. <i>Environ Sci Pollut Res.</i> 2015; 22:119-134.</p> <p>Simon-Delso N. et al. Systemic insecticides (neonicotinoids and fipronil): trends, uses, mode of action and metabolites. <i>Environ. Sci. Pollut. Res.</i> (2015) 22:5-34.</p>					

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		<p>Mason R. et al. Immune suppression by neonicotinoid insecticides at the root of global wildlife declines. J Environ Immuno Tox. Mar-Apr 2013; 1:1, 3-12.</p> <p>Chen M. Quantitative analysis of neonicotinoid insecticide residues in foods: implication for dietary exposures. J.Agric.Food Chem. 2014 -07-02;62(26):6082.</p>					
Xiangmei	Wu	Have the authors considered that increased A/C use in extreme hot or cold days may result in reduced natural ventilation in residential or commercial buildings , which may result in the accumulation of indoor air pollutants?	Ch 3: Air Quality				The assessment does not include detailed discussions of climate mitigation, adaptation, or economic valuation. Consideration of greenhouse gas emissions pathways and human adaptive capacity has been included as appropriate to assess projected climate impacts on human health.
Thomas	Driscoll	<p>Ms. Sarah Dunham</p> <p>Director, Office of Atmospheric Programs</p> <p>United States Environmental Protection Agency</p> <p>1200 Pennsylvania Avenue NW</p> <p>6207-A</p> <p>Washington, DC 20460</p> <p>June 5, 2015</p> <p>Dear Ms. Dunham:</p> <p>National Farmers Union (NFU) appreciates the opportunity to comment on the United States Global Change Research Program’s</p>	Ch 6: Food Safety				<p>As noted in the Introduction, the impacts of climate change on agricultural production, costs, or trade, and health impacts associated with changes in production, costs, or trade, are outside the scope of this chapter. References have been provided in the chapter text for discussion of these important topics elsewhere. A finding from the USDA Food Security Report has also been added to the introduction text to help highlight the importance of this topic while noting it is beyond the scope of this report.</p> <p>Adaptation and costs of adaptation, to climate change are beyond the scope of the entire report. The issue of pressures not related to climate change on farm size, distribution, or other economic issues as well as the potential secondary or indirect threats climate change would impose on human health due to consolidation of farms, while of concern, is also beyond the scope of this chapter. For health impacts specific to occupational health (e.g. health of outdoor workers) please see the revised Populations of Concern section in this</p>

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		<p>(USGCRP) Draft Impacts of Climate Change on Human Health in the United States: A Scientific Assessment (Assessment). NFU has nearly 200,000 family farmer, rancher and fisherman members nationwide and organized divisions in 33 states. We have supported family agriculture and rural communities since 1902, because “The family farm is the keystone of a free, progressive, democratic national society, as well as a strong America, and is the basis of a safe, secure and stable food system.” Our comments explain additional consequences not explored in the Assessment that climate change may create for food safety that NFU encourages the USGCRP to consider for inclusion in the final assessment. These consequences stem from the disproportionate impact climate change will carry for family farmers and the subsequent erosion of local food systems.</p> <p>I. Disproportionate Impact on Family Farmers</p> <p>The U.S. offers the most secure food system in the world. This achievement begins with farmers and will be jeopardized when farmers’ ability to produce food is disrupted. Such disruption is anticipated due to climate change, and the Assessment explains many of the ways that climate change will make food production more difficult. Farmers who continue operating through the changing climate are, in many cases, going to find adaptation to climate change expensive, and consumers are going to be subject to new inconsistencies in the food supply.</p> <p>The expenses associated with adapting to climate change are of particular concern to family farmers. A recent U.S. Department of Agriculture (USDA) report said, “Current climate change effects are challenging agricultural management and are likely to require major adjustments in production practices over the next 30 years.” The severity of the necessary adjustments indicates that they will</p>					chapter as well as Chapter 9: Populations of Concern.

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		<p>be very costly to implement. In many cases, the expense of farming in a changing climate will drive family farmers who service local or regional food systems, with insufficient capital or access to investors, out of business. The costs of climate change are also likely to restrict new entrants from starting farm businesses by increasing the initial investment needed, leaving more land available for farm consolidation.</p> <p>These types of farmers frequently operate by servicing local and regional food systems, since access to national and global markets often requires extensive capital and investment in infrastructure and equipment. These producers are less likely to be able to successfully cope with, for example, investments required to drill deeper wells as precipitation patterns and access to surface water resources changes with the climate. The major adjustments predicted by USDA will also require policy shifts that, if not executed carefully and equitably, may also place family farmers at risk and encourage farm consolidation. Climate change, then, is very likely to have a disproportionately severe negative impact on producers who can participate in local or regional food distribution systems, leading to erosion of food systems outside the national and global networks.</p> <p>II. Diminished Local and Regional Food Networks and Hazards of Consolidation</p> <p>NFU would like consolidation of the food system to be added to the Assessment as another hazard of climate change under section 6.5, "Distribution and Access." The loss of family farmers presents serious challenges to the resiliency of the food system. As farmers leave and farmland consolidates, communities across the U.S. will become increasingly reliant on national and global food</p>					

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		<p>distribution networks and more exposed to those networks' climate vulnerabilities.</p> <p>Commercial shipping, including food shipping, is vulnerable to interference related to climate change. Extreme weather events can destroy railways and roads, or make them temporarily impassible. Ports and river barge traffic are subject to storm surges and drought. Relying on food from distant sources could be disastrous if acute weather events cut off shipping routes. Even if shipping is encumbered rather than cut off completely, it will drive prices up. These hazards are documented in the Assessment, but the compounding effect of diminishment or loss of local and regional food networks is not yet included.</p> <p>In order to withstand long-haul shipping disruptions, communities need to diversify their food sources. Proper utilization of local food resources, especially local producers, is an important way to mitigate this risk. Increased utilization of local and regional producers would help ensure resilient food supply structures are in place if national distribution channels fall victim to climate-related disturbances. Unfortunately, as discussed previously, farmers who are equipped to feed nearby communities will, in many cases, face more serious challenges in remaining operational through climate challenges than farms participating in national or global distribution chains. Farmers who service local food systems are more likely to be smaller family farms with less access to capital. They are, then, less likely than larger operations to be able to afford the investments, such as increased inputs to help cope with heat, pest or weed stress, deeper wells to increase access to groundwater, or irrigation equipment to cope with changing rainfall, that are needed to keep farming. In an acute climate-related transportation emergency, these farmers might be able to nourish their communities. But the added expense of operating in a changing climate will close many of these farms, weakening this important safety net.</p>					

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		<p>III. Conclusion</p> <p>NFU hopes that, even as our members continue to experience the negative impacts of climate change, the USGCRP, Environmental Protection Agency, USDA and the administration at large will continue to work toward mitigating climate change to avoid more severe consequences and encourage adaptation to cope with the consequences that cannot be avoided. This work is critical to family farmers and everyone for whom we produce food, fiber, feed and fuel. We appreciate your efforts to explain the impacts of climate change on human health and urge you to include the additional detrimental impact on human health that will occur as climate-related costs are incurred by family farmers.</p> <p>NFU stands ready to offer any support and assistance USGCRP may find helpful in evaluating these matters for the Assessment. Thank you for your consideration of these comments.</p> <p>Sincerely,</p> <p>Roger Johnson</p> <p>President</p>					
James	Crooks	<p>Dust storms are mentioned below in a Box in section 7.6; they should be mentioned here. There is a sizeable literature on health impacts of dust storms and windblown dust, both in the U.S. and in arid regions around the world, especially the middle east and areas downwind of the Sahara and Gobi deserts.</p>	Ch 7: Extreme Events	1	253		<p>The chapter has not been restructured in this way. The box on dust storms is meant to highlight this issue and is focused on broad trends for the topic. We refer those interested in a deeper treatment of the topic to the</p>

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							provided citations. No change has been made to the text.
Catherine	Lowther	<p>Living in an urban area, climate change is certainly on my mind often. The effects of climate change are expected to effect vulnerable populations, which are often in urban areas. Areas where I live, work, and play and among individuals I do so with are expected to be negatively effected health wise as climate change continues to interact with our urban environments. Unfortunately, there is often a lack of information and education surrounding these populations, which should be addressed and changed.</p> <p>The section regarding prenatal and pregnancy outcomes and climate change was a connection I never had drawn before reading this report. As a woman, the possibility of childbearing is something that I foresee in my future. The fact that climate change can directly negatively effect my child and I is unnerving. I wish there was a section regarding a solution to this issue; as climate change becomes ever increasing an issue that is definite, I would like some solutions to prenatal and pregnancy outcomes in order to better my child as the globe continues to encounter climate change.</p> <p>The subsection explaining the vulnerabilities surrounding the elderly is a great concern. As my family continues to get older, I fear for my grandparents' health as well as my own parents'. Extreme weather events related to climate change have already been seen to drastically effect the livelihood of the older generation. Hurricane Katrina outlined the dangerous health concerns associated with climate change. The older generation cannot effectively evacuate, whether it is due to their immobility or their dependence on medications and others. These dependencies make them increasingly more vulnerable. Sociological studies have also proven that they are less likely to receive government assistance as quickly as other populations. When extreme weather events occur, the older populations, our parents and our</p>	Ch 9: Populations of Concern				<p>We appreciate your comments about our report and hope that you find the content useful. As you indicate, the adverse effects on some vulnerable populations are significant and increasing and call for identifying and implementing appropriate adaptations. However, the scope of this assessment is limited. We consciously decided that discussions of mitigation, adaptation, or economic valuation would not be within that scope.</p>

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		<p>grandparents, are likely to be so negatively effected and their lack of government assistance during these should be corrected. Possibly this correlation should be discussed the report and effective means to correct this.</p> <p>The report outlined a variety of different relationships between climate change and individual populations and groups. This report seems necessary for individuals to engage with in order to realize these connections, which many seem to not realize. If more of the United States population could access and read this information and understand the complexity of climate change and how it could effect them in such negative ways, more individuals would be more inclined to be engaging with climate change efforts and campaigns. Unfortunately, I often feel helpless in the face of climate change and it's effects on my family's health and mine. I hope that the report can address some solutions that individuals and their vulnerabilities can be attended to and changed to not feel so vulnerable and hopeless.</p>					
James	Crooks	Above and beyond susceptibility due to poverty, age, and infirmity, people living in housing with poor temperature control and/or high air infiltration are particularly vulnerable to the effects of heat, cold, and airborne particles. This is a particularly significant issue in cities and neighborhoods with older housing stock.	Ch 9: Populations of Concern				Thank you for your comment. This content is already addressed in the chapter under the relevant populations of concern.
James	Crooks	Mention dust storms.	Executive Summary		15	14	We appreciate the suggestion, and we note that the topic of dust storms is covered in a text box in the Extreme Events chapter. The authors have determined that the state of the science from the peer reviewed literature does not support inclusion of dust storms in Key Finding 1. No change has been made to the text.
Thomas	Driscoll	Footnotes to National Farmers Union Comments, Comment ID 125628, User ID 41131:	Ch 6: Food Safety				The suggested reference has been added.

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		<p>Policy of the National Farmers Union,” March 2015. http://www.nfu.org/nfu-2015-policy/2066</p> <p>“The Global Food Security Index,” The Economist Group, http://foodsecurityindex.eiu.com/Country/Details#United%20State S.</p> <p>Walthall, C.L., J. Hatfield, P. Backlund, L. Lengnick, E. Marshall, M. Walsh, S. Adkins, M. Aillery, E.A. Ainsworth,</p> <p>C. Ammann, C.J. Anderson, I. Bartomeus, L.H. Baumgard, F. Booker, B. Bradley, D.M. Blumenthal, J. Bunce, K. Burkey, S.M. Dabney, J.A. Delgado, J. Dukes, A. Funk, K. Garrett, M. Glenn, D.A. Grantz, D. Goodrich, S. Hu, R.C. Izaurralde, R.A.C. Jones, S-H. Kim, A.D.B. Leaky, K. Lewers, T.L. Mader, A. McClung, J. Morgan, D.J. Muth, M. Nearing, D.M. Oosterhuis, D. Ort, C. Parmesan, W.T. Pettigrew, W. Polley, R. Rader, C. Rice, M. Rivington, E. Rosskopf, W.A. Salas, L.E. Sollenberger, R. Srygley, C. Stöckle, E.S. Takle, D. Timlin, J.W. White, R. Winfree, L. Wright-Morton, L.H. Ziska. 2012. Climate Change and Agriculture in the United States: Effects and Adaptation. USDA Technical Bulletin 1935. Washington, DC. 186 pages. At 119. http://www.usda.gov/oce/climate_change/effects_2012/CC%20and %20Agriculture%20Report%20%2802-04-2013%29b.pdf</p>					
Vijay	Limaye	List chemical formula for ozone (O3)	Ch 3: Air Quality		88	5	The text has been revised to incorporate this suggestion.
Vijay	Limaye	Add “concentrations of” before “atmospheric”	Ch 3: Air Quality		88	11	The text has been revised to incorporate this suggestion.
Vijay	Limaye	Use “spatial distribution” instead of “location”	Ch 3: Air Quality		88	16	After considering this comment, we believe the original text is both clear and accurate
Vijay	Limaye	Add “of air pollution and its precursors” after “biogenic”	Ch 3: Air Quality		88	28	After consideration of this point, we still feel the existing text is clear and accurate.
Vijay	Limaye	<p>Add “(depending on fuel source)” after emissions, and include citations:</p> <p>Bernard, Susan M., Jonathan M. Samet, Anne Grambsch, Kristie L. Ebi, and Isabelle Romieu. 2001. “The Potential Impacts of</p>	Ch 3: Air Quality		88	31	We incorporated the first edit and the references that were most directly relevant.

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		<p>Climate Variability and Change on Air Pollution-Related Health Effects in the United States.” Environmental Health Perspectives 109 (Suppl 2): 199.</p> <p>Hadley, S. W., D. J. Erickson III, J. L. Hernandez, C. T. Broniak, and T. J. Blasing. 2006. “Responses of Energy Use to Climate Change: A Climate Modeling Study.” Geophysical Research Letters 33 (17): L17703.</p> <p>Jacob, D. J., and D. A. Winner. 2009. “Effect of Climate Change on Air Quality.” Atmospheric Environment 43 (1): 51–63.</p> <p>Kinney, Patrick L. 2008. “Climate Change, Air Quality, and Human Health.” American Journal of Preventive Medicine 35 (5): 459–67. doi:10.1016/j.amepre.2008.08.025</p> <p>Knowlton, Kim, Joyce E. Rosenthal, Christian Hogrefe, Barry Lynn, Stuart Gaffin, Richard Goldberg, Cynthia Rosenzweig, Kevin Civerolo, Jia-Yeong Ku, and Patrick L. Kinney. 2004. “Assessing Ozone-Related Health Impacts under a Changing Climate.” Environmental Health Perspectives 112 (15): 1557–63. doi:10.1289/ehp.7163.</p>					
Vijay	Limaye	<p>Particulate matter air pollution is responsible for more adverse health effects than ozone, shouldn't it be referenced before ozone? (like the Pope et al. 2002 study, etc.)</p> <p>In general, it would be helpful to make clear that while PM2.5 is more harmful to health than O3, there is less certainty about the effects of climate change on ambient PM2.5 concentrations.</p>	Ch 3: Air Quality		89	2	We revised the chapter to more clearly indicate the uncertainties associated with future climate-related PM2.5 changes.
Vijay	Limaye	These mechanisms underlying these statements are not adequately explained/cited	Ch 3: Air Quality		89	14	Inadequate information in the comment. No change has been made.
Vijay	Limaye	More attention should be given to the complex climate-O3 relationship (warmer temperatures accelerate both ozone production and destruction)	Ch 3: Air Quality		89	33	We appreciate this suggestion, but space is limited. The author team has deliberated and agreed on the most important information and illustrations to include.

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Vijay	Limaye	Over the entire US, or is it possible to constrain this statement to a specific region (mid-latitude?)	Ch 3: Air Quality		91	1	The text has been revised to incorporate this suggestion.
Vijay	Limaye	Can also include citation referring to IPCC 2013 health/climate assessment as justification for focus on ozone	Ch 3: Air Quality		91	2	We appreciate the suggestion, but feel the current references are appropriate and adequate given the chapter's space limitations. We reference IPCC 2013 later in the chapter in a more relevant context.
Vijay	Limaye	List PM2.5 and O3 in the text (CO2 already listed)	Executive Summary		7	4	All Key findings have been reviewed and revised. This text does include particulate matter and ozone.
Vijay	Limaye	Figure ES3 legend is not legible	Executive Summary	3	8		Figure has been revised.
Vijay	Limaye	Caption for figure ES3 - is the "thousands of additional ozone-related illnesses and premature deaths each year" referring to a specific study? Citation needed.	Executive Summary	3	8		The citation is provided in the caption. The text in Air Quality Impacts chapter has been revised to incorporate this suggestion. See also Populations of Concern chapter.
Rachel	Locke	<p>The Children's Environmental Health Network (CEHN) commends the U.S. Global Change Research Program (USGCRP) on the Draft Climate and Health Assessment report and on its review of the latest science on human health implications of climate change, and appreciates the opportunity to comment on the report.</p> <p>Climate change has and will continue to significantly alter the global environment. In addition to the health of the environment CEHN recognizes that climate change presents major challenges to the health and welfare of children, and that children in communities that are already disadvantaged will be the most harmed. Therefore, CEHN takes the following positions on climate change:</p> <ul style="list-style-type: none"> • Urges prompt action to mitigate global climate change 					<p>We greatly appreciate your positive comment about our report and hope that you find the content useful. Policy issues are beyond the defined scope of the Climate and Health Assessment, a scientific document that provides the basis for decision making, but does not address policy or make recommendations.</p> <p>Regarding comments on the Populations of Concern chapter, the commenter provides no definitive suggestions for where to incorporate new citations, requests for clarification, new wording, etc. As such, no changes have been made to the chapter text based on this comment.</p>

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		<ul style="list-style-type: none"> ● Promotes the inclusion of children’s specific vulnerabilities, needs, and social health outcomes in international, national, state, and local climate change policies/adaption plans ● Encourages collaboration of partners across disciplines and among different types of organizations to develop innovative and comprehensive approaches to mitigation and adaptation ● Calls for additional research to determine to what extent and how children’s health will be affected by climate change and what domestic/international policies, structures, and systems need to be developed, implemented, and sustained in order to protect all children ● Charges all professionals serving families and children to work to minimize the harmful health effects global climate change may have on children through educational outreach and other relevant activities <p>We acknowledge the efforts this team of writers and reviewers have extended to this draft report, especially in identifying children as a vulnerable population to climate change effects. The "Research Needs" and “Key Findings” sections of the report help the reader digest the chapter information and understand the state of science. The figures, diagrams, and tables are also helpful. However, there are several points in each chapter where more specific information is needed. CEHN is pleased to offer recommendations below to aid this effort.</p> <p>About the Children’s Environmental Health Network</p> <p>CEHN is a national multi-disciplinary organization whose mission is to protect the developing child from environmental hazards and</p>					

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		<p>promote a healthier environment. CEHN’s Board of Directors and advisory committee members include internationally-recognized experts in children’s environmental health science and policy who serve on key Federal advisory panels and scientific boards. We recognize that children, in our society, have unique moral standing.</p> <p>CEHN strives to promote the incorporation of the following basic pediatric facts into policy and practice:</p> <ul style="list-style-type: none"> • Children can be more susceptible and more vulnerable than adults to toxic chemicals and certain health outcomes; • Children are growing. Pound for pound, children eat more food, drink more water, and breathe more air than adults. Thus, they are likely to be more exposed to substances in their environments than adults; • Children’s systems, including their nervous, reproductive, digestive, respiratory, and immune systems, are developing. This process of development creates periods of vulnerability; • Children have a longer life expectancy than adults, thus they have more time to develop diseases with long latency periods that may be triggered by early environmental exposures. 					
Rachel	Locke	The explanation to the studies approach to quantified uncertainty, such as high confidence is well written.	Executive Summary				We greatly appreciate your positive comment about our report and hope that you find the content useful.
Rachel	Locke	Temperature extremes can also worsen chronic conditions such as cardiovascular disease, respiratory disease, cerebrovascular disease, and diabetes-related conditions. It should also be mentioned that extreme temperatures, which affect air quality, worsen child related illness (i.e. decrease in IQ, lung development etc.) due to developing neurological and organ systems. See report: Poursafa, P., & Kelishadi, R. (2011). What health professionals should know about the health effects of air pollution and climate	Executive Summary		5	11	The text has been changed in the executive summary to match the findings of the chapter on populations of concern. No additional changes have been made to the text in the executive summary, as space is limited and the executive summary is meant to be a high level summary of the report. Please see the chapter

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		change on children and pregnant mothers. Iranian Journal of Nursing and Midwifery Research, 16(3), 257–264.					on Populations of Concern for more specific information on these topics.
Rachel	Locke	<p>These bullets go over the health trends related to the presence of chronic disease, ill health, and disease risk. Each bullet addresses various age ranges (“older than 65”, and “over the age of 20”) but excludes children, those under the age of 20. To complete the age demographics outlined in these bullets it is recommended to include a statistic on children or adolescent health. For example: Recent estimates in the United States show that about one in six, or about 15%, of children aged 3 through 17 years have a one or more developmental disabilities (CDC: http://www.cdc.gov/ncbddd/developmentaldisabilities/facts.html)</p> <p>OR The percentage of children aged 6–11 years in the United States who were obese increased from 7% in 1980 to nearly 18% in 2012. Similarly, the percentage of adolescents aged 12–19 years who were obese increased from 5% to nearly 21% over the same period. (1. Ogden CL, Carroll MD, Kit BK, Flegal KM. Prevalence of childhood and adult obesity in the United States, 2011-2012. Journal of the American Medical Association 2014;311(8):806-814. 2. National Center for Health Statistics. Health, United States, 2011: With Special Features on Socioeconomic Status and Health. Hyattsville, MD; U.S. Department of Health and Human Services; 2012.)</p>	Ch 1: Preface and Introduction		31	2	The text has been revised to clarify.
Rachel	Locke	<p>Table 1. Current estimates and future trends in chronic medical conditions that interact with the health risk associated with climate change. The table is helpful in giving a snapshot of the current health risk and conditions of the adult population. However the report would benefit from adding more information on the current state of children’s health.</p> <ul style="list-style-type: none"> ● Row 4, Diabetes, column 1, Current Estimates: In 2012, approximately 9% of the U.S. population had diabetes. Currently the incidence rate of diabetes in young adult and children is increasing. Children are beginning to make up a large portion of the 9% of U.S. diabetic population. It is recommended to add information on childhood diabetes i.e. more than 18,000 youth diagnosed with type I diabetes each year in 2008 and 2009, and more than 5,000 youth diagnosed with type II diabetes each year in 2008 and 2009. (CDC, 2014 National Diabetes Statistics Report, http://www.cdc.gov/diabetes/data/statistics/2014statisticsreport.ht 	Ch 1: Preface and Introduction	1	32		Text has been revised and references provided in regards to childhood statistics on diabetes and obesity. Because there is limited support in the literature for US rates of childhood mental health and functional disabilities (as different from developmental disabilities), the authors do not find it appropriate to add these topics to this summary table. More information on children's health and vulnerability can be found in the chapter on Populations of Concern.

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		<p>ml)</p> <ul style="list-style-type: none"> • Row 6, Mental Illness, column 1, Current Estimates: Mental illness is on the rise in children, especially children in low-income and minority groups. There should be a statement on the prevalence of mental illness in children. • Row 7, Obesity, column 1, Current Estimates: In 2009-2010, approximately 35% of American adults were obese. This should also include information on obesity rates in children. i.e. - In 2012, more than one third of children and adolescents were overweight or obese. (Ogden CL, Carroll MD, Kit BK, Flegal KM. Prevalence of childhood and adult obesity in the United States, 2011-2012. Journal of the American Medical Association 2014;311(8):806-814.) • Row 8, Functional Disabilities, column 1, Current Estimates: This section goes over the health trends related to functional disabilities. The report addresses various age ranges (“age 18-44”, “ages 45-64”, and “persons 65 and older”) but excludes children/adolescents, those under the age of 18. To complete the age demographics outlined in these bullets it is recommended to include a statistic on functional disabilities of children, ages 0-18yrs 					
Rachel	Locke	<p>Page 60, lines 15-16 note that the U.S. population has become less sensitive to heat due to a combination of how many homes and businesses have air conditioning. This leaves out crucial environments that children spend a sizable portion of their time in: child care centers and school environments. It should be noted here that children’s health and development can be at risk of temperature related illnesses when they spend time in these environments that lack air conditioning. The working paper released by the National Bureau of Economic Research could be cited: Temperature and Human Capital in the Short- and Long-Run, which shows that short run changes in temperature lead to statistically significant decreases in cognitive performance on math: http://www.nber.org/papers/w21157. Another point to consider is that in the event of an extreme temperature event, air conditioning units and systems can be compromised, leaving parts</p>	Ch 2: Temperature-Related Impacts		60	15	<p>The text has been revised to mention schools and other environments that may lack air conditioning. There is mention made of the possible interactions between high temperatures and system failures. The NBER working paper was not cited because it is not yet fully peer-reviewed, but other papers by those authors have been cited in this chapter.</p>

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		of the population without resilient systems without air conditioning.					
Rachel	Locke	It would be beneficial to add a sentence or two on ground level ozone effect on children's health. More information from U.S. EPA Summer Time Safety http://epa.gov/airquality/ozonepollution/pdfs/safety.pdf	Ch 3: Air Quality		89	32	We discuss the risks to children from ozone exposure in the section on populations of concern (3.6).
Rachel	Locke	This portion refers to allergic illnesses, hay fever and asthma rates in the U.S. population. Allergic illnesses in children has drastically increased therefore it is recommended that the report include statistics on the increase in childhood asthma and other allergic illnesses in children. More information from U.S. EPA Summer Time Safety http://epa.gov/airquality/ozonepollution/pdfs/safety.pdf	Ch 3: Air Quality		95	13	We appreciate the suggestion but feel the current references are appropriate and adequate. The reference in question is specific to ozone; and not to climate/CO2 impacts on aeroallergens per se.
Rachel	Locke	As an example of indoor ozone exposure the report uses elderly's sensitivity to short term ozone exposure. Since children are also a sensitive population to ozone exposure like the elderly there should be a sentence on children's indoor exposure to ozone and potential health effects. More information from U.S. EPA Summer Time Safety http://epa.gov/airquality/ozonepollution/pdfs/safety.pdf	Ch 3: Air Quality		97	26	The text has been revised to incorporate this suggestion. See also vulnerable populations chapter.
Rachel	Locke	This section states: "African American, women, and elderly experience greatest baseline risk from air pollution whereas young, older adults, asthmatics, and people whose immune system are compromised are more vulnerable to indoor air pollution." Children are at greatest risk for both and should be included in the first statement as well.	Ch 3: Air Quality		99	27	Appropriate language has been added to address this point.
Rachel	Locke	This chapter does a good job of characterizing the health risk associated with an increase in West Nile disease and Lyme disease across the U.S.. It is critical, however, to include information on the potential increase in West Nile and Lyme disease found in children due to their extended time outside during warmer months. For more information see- CDC- Confirmed Lyme disease cases by age and sex--United States, 2001-2010 http://www.cdc.gov/lyme/stats/chartstables/incidencebyagesex.html	Ch 4: Vectorborne Diseases				The text in the Populations of Concern section of this chapter addresses this comment by discussing the many factors that may play an important role in population vulnerability to vectorborne diseases.
Rachel	Locke	Page 137, lines 1, 2: The report refers to advanced age and males having increased risk of being bitten by a mosquito. In the same vein the report should include children, because children are not in school during the summer months and spend a large amount of	Ch 4: Vectorborne Diseases		137	1	The text addresses age and gender as factors that may increase susceptibility to severe WNV infections. The authors are not aware of data

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		time in recreational areas with standing water where mosquitoes live and breed.					that suggests that exposure factors vary by age or gender for WNV.
Rachel	Locke	Pages 164-165 include a table that outlines pathogens/toxins/agents, their waterborne exposure routes, health outcomes and symptoms, and major climate correlations or drivers. While this table is very helpful in outlining the different types of climate sensitive agents of water-related illness, language either in the table, in the further descriptions of these pathogens/toxins/agents, or in the populations of concern section should be added to describe which of these are most dangerous to children. Diseases and health outcomes suffered by children, or pregnant mothers can cause life-long damage, and have more time to manifest themselves. Describing here how specifically children’s long term health can be affected by these water related illnesses is important. The increased risk exposure of children and of pregnant women is mentioned in the populations of concern chapter, but this chapter should be more specific.	Ch 5: Water-Related Illness	1	164		We appreciate this suggestion, but space is limited. The author team has deliberated and agreed on the most important information and illustrations to include. Section 5.5 discusses those children’s health risks from water-related illness that are well-supported in the literature.
Rachel	Locke	The Populations of Concern section does not have enough specific information about the vulnerabilities of children with relation to food safety, nutrition and distribution. While the section states that “children may be especially vulnerable because they eat more food by body weight than adults and do so during important stages of physical and mental growth and development”, a sentence should be added that the nutritional content or lack thereof of the food they eat during this crucial developmental time is also important, especially to avoid chronic health conditions like obesity and diabetes later in life. Especially, as the chapter notes, since rising CO2 can reduce the nutritional value of most food crops and is expected to do so in the future (page 220, lines 36-38).	Ch 6: Food Safety		224	21	Text has been added to the Populations of Concern section of this chapter regarding E Coli and pesticides. However, due to the size of the topic, and the page limit for the chapter, we focused on broad trends rather than providing such a level of specificity. Please see Chapter 9: Populations of Concern for additional detail regarding children’s vulnerability in the context of food safety, nutrition and distribution.
Rachel	Locke	The chapter states here that climate induced changes in pest distributions and populations of pests will likely lead to an increased use of pesticides and as such, increased human exposure to pesticides. Children have been shown to be uniquely vulnerable to pesticide exposure from a number of different pesticides, and studies have shown different types of pesticides can hinder neurodevelopment, have linked pesticide exposure to childhood cancers and asthma exacerbation. (The Pesticide Action Network of North America has a report with many studies that relate to these exposure consequences:	Ch 6: Food Safety		219	19	The chapter focused on broad trends on this topic. Additional details regarding children’s health have been added to the populations of concern section, where it notes vulnerability to pesticides. More information on vulnerabilities specific to children can be found in Chapter 9: Populations of Concern.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		http://www.panna.org/sites/default/files/KidsHealthReportOct2012.pdf					
Rachel	Locke	The example health outcomes and symptoms of flooding do not mention long term flooding damage that can cause mold/fungi growth which can affect children's health by increasing asthma incidence and exacerbating allergies.	Ch 7: Extreme Events	1	253		We appreciate the suggestion, but space is limited. The author team has deliberated and agreed on the most important information/illustrations to include that reflect the body of literature available for impacts within the US. We have included a reference to the chapter on Air Quality, which discusses the emerging literature regarding potential for dampness problems to affect indoor air quality and have respiratory effects.
Rachel	Locke	The section that begins here details the three elements that encompass vulnerability: exposure, sensitivity, and adaptive capacity. In the vulnerable populations section of this chapter, it should be noted that children are especially vulnerable in relation to these three elements because children often do not have control over their exposure, less so than adults, are definitively sensitive to climate events, and often have less adaptive capacity than other populations.	Ch 7: Extreme Events		254	9	The text has been revised to incorporate this suggestion.
Rachel	Locke	Report should include a breakdown of the demographics (age groups, etc.) of the Bouchama et al. 2007 study referenced.	Ch 8: Mental Health		299	22	We appreciate the comment but due to page limit for the chapter and scope of topic we are unable to provide that level of detail but those who are interested are welcome to read the complete article that is cited.
Rachel	Locke	This chapter, specifically in Key Finding 4, does not address the effect of climate-related illnesses on children who are taking behavior related medications such as Ritalin, it only discusses elderly. There should be an inclusion of children who are on behavior modification medications and the potential effect climate change has on their health.	Ch 8: Mental Health		315	4	The authors appreciate the comment and primarily focused on the elderly as the literature discussing the impact of extreme heat identified mainly the older population as having observed negative health impacts due to heat and having used medications. We have included in the emerging issues section some discussion regarding children and behavior modification medications.
Rachel	Locke	This chapter should include information on high risk coping behavior of children due to extreme weather events, child suicide rates, and increase in violent behavior due to chronic stress associated with climate change. See paper from Jyotsana Shukla, "Extreme Weather Events and Mental Health: Tackling the	Ch 8: Mental Health				We appreciate the suggestion, however the authors feel the current references are appropriate and adequate.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		Psychosocial Challenge,” ISRN Public Health, vol. 2013, Article ID 127365, 7 pages, 2013. doi:10.1155/2013/127365					
Rachel	Locke	Although athletes are at great risk of exertional heat illnesses, other children who spent long amounts of time outdoors (doing general play, intramural sports, sports other than football etc.). There should be more information in this section on heat related physical exertion in children who are not just sports players. This also applies to page 345, lines 1-3.	Ch 9: Populations of Concern		345	31	We have clarified the text in the relevant sections of this chapter. The discussion on athletes reflects the fact that this has been a well-studied topic in the peer-reviewed literature.
John	Wiener	Thank you for attention to Indigenous Peoples!	Executive Summary		2		We greatly appreciate your positive comment about our report and hope that you find the content useful.
John	Wiener	Populations at risk from occupational exposure should include Indigenous Peoples engaged in subsistence practices and other outdoor activities.	Executive Summary		6		No change has been made to the text of the executive summary, as this is only a high level summary. Please see the section on Indigenous peoples in the chapter on Populations of Concern.
John	Wiener	Populations at risk from occupational exposure should include Indigenous Peoples engaged in subsistence practices and other outdoor activities.	Executive Summary		6		No change has been made to the text of the executive summary, as this is only a high level summary. Please see the section on Indigenous peoples in the chapter on Populations of Concern.
John	Wiener	Perhaps mention the high proportion of the rural population that uses drinking water from wells which are not monitored (EPA data available; Safe Drinking Water websites). The risk may be particularly high where water quality is affected by changes in hydrology and recharge, and energy development, particularly hydro-fracturing (data are limited and there is controversy over interpretation and lack of data).	Executive Summary		11		Text within the Water Related Illness chapter has been revised to include this suggestion. This report assesses the health impacts from climate change, but does not discuss the impacts from energy production methods. It also does not include discussion of mitigation, or co-benefits of mitigation.
John	Wiener	Thank you for important work on nutritional quality of food with increased carbon dioxide and other changes!	Executive Summary		13		We greatly appreciate your positive comment about our report and hope that you find the content useful.
John	Wiener	Thank you for noting the importance of extreme precipitation events; this should be more widely appreciated.	Executive Summary		11		We greatly appreciate your positive comment about our report and hope that you find the content useful.
John	Wiener	Though it is noted in chapter 9, please consider adding a reference in the executive summary to the mental health impacts of community displacement (e.g. coastal Louisiana, coastal Alaska)	Executive Summary		17		Mental health impacts are mentioned in the executive summary, including in a new summary diagram that outlines examples of exposure pathways. However, due to limited

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		and loss of subsistence livelihoods and place-based cultural identity.					space, the author team has agreed on the most important information and illustrations to include in the Executive Summary, rather than providing specific references or location-based examples. This topic is discussed in more detail in the chapter on Populations of Concern and to some degree in the section on extreme weather events in the chapter on Mental Health and Well Being.
John	Wiener	Please consider noting the possibility, as yet not documented to the commenter's knowledge, that sea level rise, combined with increased acidity of sea surface water and precipitation, may interact with industrial sediments that have been relatively immobile since deposition where the sediments have been above intrusion of sea water and below impermeable caps from subsequent paving and development of urban areas. This is a concern based on the historic fact of industrial agglomeration (e.g. printing activities, hide tanning activities, etc.) in small areas which later were redeveloped for other uses. The fate of their waste streams from the 19th and early 20th Centuries may be unknown. This is a problem that may have been studied, and the commenter apologizes for lack of knowledge. If possible, perhaps the USGS might be consulted.	Ch 6: Food Safety		218		This suggestion is not documented in the peer-reviewed literature sufficiently to be included in this report. The authors direct the commenter to review the section on metals and other chemical contaminants (section 6.3.3) that enter water and food systems during floods and storms.
John	Wiener	At the risk of using time without effect, THANK YOU! This is not well-known in my experience and your diligence in this area should be appreciated.	Ch 6: Food Safety		211	29	We appreciate your positive comment.
John	Wiener	Regarding key Finding 3 and subsequent text explanation, two additional considerations might be noted: Exposure to extreme events may vary with populations so that some are more at risk due to the nature of the socioecological systems in which they live, more particularly than race/ethnicity and occupation. P. 255 rightly notes important variations in adaptive capacity, but does not include place-based culture as a factor affecting risk.	Ch 7: Extreme Events		252		They Key Finding text has been revised to be consistent with the vulnerable populations language used throughout the report. We appreciate the comments on subsistence resources and indigenous peoples. Due to space limitations these comments were not incorporated.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		Extreme weather can dramatically affect subsistence resources, such as wildlife or wild plants that are important for the well-being of Indigenous peoples, and also provide income to many others through use of these resources for food, medicine, harvest such as mushrooming, and other uses. Loss of important elements of Indigenous diets can be highly adverse.					
John	Wiener	<p>Thank you for your attention to Indigenous Peoples; although you cite Consulo Willox, there may be additional materials relevant to the particular problems of loss of place, for people with place-based cultures. The Climatic Change special issue, 2014, on Climate Change and Indigenous Peoples in the U.S., Vol 120 No. 3 has some discussion of this, sprinkled throughout, and there are some references in the literature on the United Nations Declaration on the Rights of Indigenous Peoples (e.g. Abate, R.S., and E. A. Kronk, Eds., 2013, Climate Change and Indigenous Peoples: the Search for Legal Remedies. Cheltenham UK and Northampton MA: Edward Elgar). Earlier references appear in ethnographies, but it may not be worthwhile to dig out a list.</p> <p>An additional reference that strongly supports this point is Posey, D.A., Ed., 1999, Cultural and Spiritual Values of Biodiversity: A Complementary Contribution to the Global Biodiversity Assessment. London: Intermediate Technology for United Nations Environment Programme.</p>	Ch 8: Mental Health		302		<p>The authors appreciate the suggested additional references. We have added two references to the chapter:</p> <p>Koppel, J., Shearer, C., Bronen, R., Peterson, K., Lazrus, H., (Eds.) The Impact of Climate Change on Tribal Communities in the US: Displacement, Relocation, and Human Rights [Special Issue]. Climatic Change 120.3 (2013): 601-14.</p> <p>Jim Berner, Christopher Furgal, et al. Chapter 15: Human Health. Arctic Monitoring, Assessment Programme, ACIA-Arctic Climate Impact Assessment, Program for the Conservation of Arctic Flora, and International Arctic Science Committee. Arctic Climate Impact Assessment-Scientific Report. Cambridge University Press, 2005. pp. 863-906.</p>
John	Wiener	<p>Among vulnerability factors that contribute to exposure:</p> <p>Exposure of critical subsistence elements such as wildlife and plants needed for diet and other purposes may also be highly significant for Indigenous Peoples and some others.</p>	Ch 9: Populations of Concern		339		The section on Indigenous Peoples already acknowledges this finding; no changes made to the chapter text.
John	Wiener	<p>Re Sec. 9.4.2:</p> <p>Additional references:</p>	Ch 9: Populations of Concern		343		This citation has been included in Section 9.4.2 and in the References.

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		<p>The Special Issue of Climatic Change, 2013, on Climate Change and Indigenous Peoples in the U.S., Vol. 120 No 3;</p> <p>Nakashima, D.J., K. Galloway McLean, H.D. Thulstrup, A. Ramos Castillo, and J.T. Rubis, 2012. Weathering Uncertainty: Traditional Knowledge for Climate Change Assessment and Adaptation. Paris, UNESCO, and Darwin, UNU, 120 pp.</p>					
John	Wiener	<p>Thank your including the index of vulnerability! If possible, perhaps add the citations of choice by one of the great leaders in Natural Hazards and Vulnerability, Dr. Susan Cutter, whose work developing and applying the Index has been a major contribution. her citations may be valuable for readers. The 2008 PNAS citation is only one of many that might be included.</p>	Ch 9: Populations of Concern		355		<p>Thank you for your comment. We agree that Cutter’s work is important and have cited pertinent references.</p>
Roger	Caiazza	<p>These are my personal comments on this table. As a meteorologist and air quality scientist I am embarrassed by this report in general. It is so clearly a political document conceived and prepared with only one goal: support the President’s catastrophic climate change agenda. As such nothing I can say and whatever number of points that I can refute as clear exaggeration and truth stretching will alter the document but I am compelled to pick one example to demonstrate my point.</p> <p>Under the veneer of peer-reviewed literature the authors have made statements in this document have, at a minimum, provided quotes out of context or have eliminated qualifying statements that imply complete certainty or mislead readers into believing that human emissions of greenhouse gases are the sole cause of the purported impact. Furthermore incorrect statements are included that are unsupportable. I see this as part of the advocacy playbook to repeat lies often enough so that people accept them as fact.</p>	Ch 7: Extreme Events	1	253		<p>After consideration of these points, we still feel the existing text is clear and accurate, and reflect the body of literature available for impacts within the US. Please see the NCA report. No change has been made to the text.</p>

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		<p>For example consider the following statement in Chapter 7 Extreme Weather, page 253 Table 1: Health Impact of Extreme Events under the heading Climate Change Drivers & Future Projections from NCA3 (Melillo et al. 2014):</p> <p>“The intensity, frequency, and duration of North Atlantic hurricanes, as well as the frequency of the strongest hurricanes, have all increased since the 1980s. Hurricane intensity and rainfall are projected to increase as the climate continues to warm.”</p> <p>This statement struck me as questionable.</p> <p>The quote is taken verbatim from Melillo, J. M., Terese (T.C.) Richmond, and G. W. Yohe, Eds., 2014: Climate Change Impacts in the United States: The Third National Climate Assessment. U.S. Global Change Research Program, 842 pp. On page 20 item 8:</p> <p>“The intensity, frequency, and duration of North Atlantic hurricanes, as well as the frequency of the strongest (Category 4 and 5) hurricanes, have all increased since the early 1980s. The relative contributions of human and natural causes to these increases are still uncertain. Hurricane-associated storm intensity and rainfall rates are projected to increase as the climate continues to warm.”</p> <p>The supporting documentation for this statement is in Melillo et al. 2014 on page 41:</p> <p>There has been a substantial increase in most measures of Atlantic hurricane activity since the early 1980s, the period during which high-quality satellite data are available.^{78,79} These include measures of intensity, frequency, and duration as well as the</p>					

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		<p>number of strongest (Category 4 and 5) storms. The ability to assess longer-term trends in hurricane activity is limited by the quality of available data. The historic record of Atlantic hurricanes dates back to the mid-1800s, and indicates other decades of high activity. However, there is considerable uncertainty in the record prior to the satellite era (early 1970s), and the further back in time one goes, the more uncertain the record becomes.⁷⁹</p> <p>The recent increases in activity are linked, in part, to higher sea surface temperatures in the region that Atlantic hurricanes form in and move through. Numerous factors have been shown to influence these local sea surface temperatures, including natural variability, human-induced emissions of heat-trapping gases, and particulate pollution. Quantifying the relative contributions of natural and human-caused factors is an active focus of research. Some studies suggest that natural variability, which includes the Atlantic Multidecadal Oscillation, is the dominant cause of the warming trend in the Atlantic since the 1970s,^{80,81} while others argue that human-caused heat-trapping gases and particulate pollution are more important.⁸²</p> <p>Hurricane development, however, is influenced by more than just sea surface temperature. How hurricanes develop also depends on how the local atmosphere responds to changes in local sea surface temperatures, and this atmospheric response depends critically on the cause of the change.⁸³ For example, the atmosphere responds differently when local sea surface temperatures increase due to a local decrease of particulate pollution that allows more sunlight through to warm the ocean, versus when sea surface temperatures increase more uniformly around the world due to increased amounts of human-caused heat-trapping gases.^{80,84} So the link between hurricanes and ocean temperatures is complex. Improving our understanding of the relationships between warming tropical oceans and tropical cyclones is another active area of research.</p> <p>Changes in the average length and positions of Atlantic storm tracks are also associated with regional climate variability.⁸⁵ The locations and frequency of storms striking land have been argued</p>					

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		<p>to vary in opposing ways than basin-wide frequency. For example, fewer storms have been observed to strike land during warmer years even though overall activity is higher than average,⁸⁶ which may help to explain the lack of any clear trend in landfall frequency along the U.S. eastern and Gulf coasts.^{87,88} Climate models also project changes in hurricane tracks and where they strike land.⁸⁹ The specific characteristics of the changes are being actively studied.</p> <p>The supporting documentation provides more nuance than the alarming statement in Chapter 7 of this document. Given the absolute nature of the description that “The intensity, frequency, and duration of North Atlantic hurricanes, as well as the frequency of the strongest (Category 4 and 5) hurricanes, have all increased since the early 1980s” I assumed that this was a conclusion of one of the references cited. But that is not the case. This paragraph provides the original text excerpted from above:</p> <p>There has been a substantial increase in most measures of Atlantic hurricane activity since the early 1980s, the period during which high-quality satellite data are available.^{78,79} These include measures of intensity, frequency, and duration as well as the number of strongest (Category 4 and 5) storms. The ability to assess longer-term trends in hurricane activity is limited by the quality of available data. The historic record of Atlantic hurricanes dates back to the mid-1800s, and indicates other decades of high activity. However, there is considerable uncertainty in the record prior to the satellite era (early 1970s), and the further back in time one goes, the more uncertain the record becomes.⁷⁹</p> <p>In my experience when a statement is footnoted by number it refers to a single specific reference. However in this case references 78 and 79 are listed as follows:</p> <p>78. Bell, G. D., E. S. Blake, C. W. Landsea, T. B. Kimberlain, S. B. Goldenberg, J. Schemm, and R. J. Pasch, 2012: [Tropical</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>cyclones] Atlantic basin [in “State of the Climate in 2011”]. Bulletin of the American Meteorological Society, 93, S99-S105, doi:10.1175/2012BAM SStateoftheClimate.1. [Available online at http://www1.ncdc.noaa.gov/pub/data/cmb/bams-sotc/climate-assessment-2011-lo-rez.pdf]</p> <p>Bender, M. A., T. R. Knutson, R. E. Tuleya, J. J. Sirutis, G. A. Vecchi, S. T. Garner, and I. M. Held, 2010: Modeled impact of anthropogenic warming on the frequency of intense Atlantic hurricanes. <i>Science</i>, 327, 454-458, doi:10.1126/science.1180568.</p> <p>Emanuel, K., 2007: Environmental factors affecting tropical cyclone power dissipation. <i>Journal of Climate</i>, 20, 5497-5509, doi:10.1175/2007JCLI1571.1.</p> <p>79. Landsea, C. W., and J. L. Franklin, 2013: Atlantic hurricane database uncertainty and presentation of a new database format. <i>Monthly Weather Review</i>, 141, 3576-3592, doi:10.1175/MWR-D-12-00254.1. [Available online at http://journals.ametsoc.org/doi/pdf/10.1175/MWR-D-12-00254.1]</p> <p>Torn, R. D., and C. Snyder, 2012: Uncertainty of tropical cyclone best-track information. <i>Weather and Forecasting</i>, 27, 715-729, doi:10.1175/waf-d-11-00085.1. [Available online at http://journals.ametsoc.org/doi/pdf/10.1175/WAF-D-11-00085.1]</p> <p>I could not find any explicit text in those references that directly supports the alarming statement in Chapter 7. I also could not find data included in those references to support the contention that the “intensity, frequency, and duration of North Atlantic hurricanes, as well as the frequency of the strongest hurricanes, have all increased since the 1980s”. On the other hand when I looked at the data itself parts of the statement are wrong.</p> <p>Figure 1: North Atlantic Accumulated Cyclone Energy</p> <p>Figures are included in my hard copy submittal</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>NOAA uses Accumulated Cyclone Energy to describe the activity of individual hurricanes and entire hurricane seasons. These plotted data are from the Wikipedia article on accumulate cyclone energy (http://en.wikipedia.org/wiki/Accumulated_cyclone_energy, downloaded on 4/10/2015). Figure 1 plots all the available data from 1950 (season values are boxes) with a linear regression model line included that should show that hurricane energy is increasing if intensity, frequency, and duration of Atlantic hurricanes is increasing. The statistics indicate that this is not the case. Because the P-value in the ANOVA table is greater or equal to 0.05, there is not a statistically significant relationship between ACE and Season at the 95.0% or higher confidence level. The R-Squared statistic indicates that the model as fitted explains 0.128864% of the variability in ACE. The correlation coefficient equals 0.0358977, indicating a relatively weak relationship between the variables.</p> <p>Figure 2: North Atlantic Accumulated Cyclone Energy Time Series</p> <p>Figures are included in my hard copy submittal</p> <p>Another way to look at these data is as a time series. Figure 2 shows the accumulated cyclone energy in the Atlantic Ocean. If the claim in this document were true then a clear trend would be visible but nothing is obvious.</p> <p>Finally, the United States is the longest drought for a major hurricane landfall in the United States (Figure 3). Again if the alarming statement that “The intensity, frequency, and duration of</p>					

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		<p>North Atlantic hurricanes, as well as the frequency of the strongest (Category 4 and 5) hurricanes, have all increased since the early 1980s” were true then it is unlikely that there would be such a long period between landfalls.</p> <p>Figure 3: Days between Major Hurricane Landfalls in the United States.</p> <p>Figures are included in my hard copy submittal</p>					
Roger	Caiazza	<p>In over 30 years of regulatory analysis and comment submittals this system takes the cake as the worst without any doubt. I prepared comments that included my own analysis of data that is most easily shown in graphs. As far as I can tell there is no way to submit that information.</p> <p>How convenient because when I say gee my data contradict your claim you can say what data and ignore my submittal.</p>					<p>The transparent process leading to this report is documented on our website and has included numerous avenues for the public to engage, including opportunities to submit literature. The public comment portal allowed for submission of references or URLs where published sources can be obtained for consideration in the assessment. We received many suggested references through both processes. All suggested literature, from both the public Call for Information (see 2014 FRN) and the references submitted through the public comment process were considered in this assessment and were screened for eligibility using Information Quality Act guidelines.</p>
Claire	Barnett	<p>The overall Assessment deeply under-estimates the risks to children's environmental health and to children in k-12 schools (and child care) and thus will tend to erode our ability to design effective research and program responses. Therefore, we strongly recommend that EPA and CDC co-convene a federal advisory working group of advocates, PEHSUs, and researchers, and including EPA's OCHP, Indoor Environments, and EJ, and CDC's NCEH/ATSDR, Emergency Services, and NIOSH, and task the new work group with developing a fresh report delineating climate change risks to children where they live, learn, and play, and to other populations of concern, understanding that these populations</p>	Executive Summary				<p>Thank you for your comment, however policy issues are beyond the defined scope of the Climate and Health Assessment, a scientific document that provides the basis for decision making, but does not address policy. Convening a federal advising working group is outside the scope of this report. Impacts on the health of children are described in detail in the chapter on Populations of Concern, which has an entire section on children and pregnant women, and are also noted throughout the report in the populations of concern sections within the chapters, where supported by the</p>

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		<p>are likely to increase their time indoors in the presence of more severe and unpredictable weather events.</p> <p>The Executive Summary should prominently position risks to children's environmental health and risks to children's safety (Federal EO 13045) -- as US EPA OCHP frames it "where they live, learn, and play"-- as a key concern for all climate work. Children are a sensitive population as partially recognized in this Assessment, but the Assessment should also recognize that children are 100% of our future: they will inherit the climate we leave them.</p> <p>We will not realize the goals of healthy and productive adults until children are healthy from birth to adulthood.</p>					<p>literature. Consideration of children's health has been expanded in numerous places throughout the report, including, for example, the table in the Introduction chapter and the Populations of Concern section of the chapter on Food Safety.</p>
Claire	Barnett	<p>This chapter should squarely address risks to children's health and ability to learn (measured by test scores) caused by high heat, and the resulting risks to adult health and risks to adult earnings potentials.</p> <p>Constitutionally education in the US is left to the states, and all states compel children to attend school (US Dept. of Education). It is also well established that high heat in classrooms will significantly drop test scores (NRC 2006, Lawrence Berkeley IAQ Resource Bank). Children with poor test scores are at risk of being held back or repeating grade, or may have fewer opportunities for higher education. High heat during the k-12 academic year will also have a disproportionate impact on children with certain chronic health conditions, such as asthma and diabetes (see this chapter), thus decreasing attendance: poor attendance is linked in the literature to poor achievement, which in turn is linked to poor health and poor earnings in later life.</p>	Ch 2: Temperature-Related Impacts				<p>The text has been amended to address this comment.</p> <p>While the issue of scores is an important point, space limitations prevent us from addressing this issue considering the range of topics to be addressed.</p>

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		Finally, VIOLENCE. Published research appears to link higher heat with increases in violence. Global warming trends may well increase violent crime rates. Better climate controls - such as those impoverished families and schools cannot afford to install -- could help reduce aggression-related problems in settings such as prisons, schools, and workplaces (Anderson, J of Am Psychological Society, 2001).					
Claire	Barnett	<p>Missing Assessment on Health! Overall the chapter needs to address what happens to populations of concern, such as children, in compromised indoor environments "where they live and learn", but the chapter addresses only the impact of climate on indoor air, not on the populations breathing the poorer indoor air.</p> <p>The chapter should also be improved by changing the title to "Outdoor and Indoor Air Quality". The chapter is unnecessarily weak and incomplete. It must provide a more robust discussion of Indoor Chemistry, outlining the complexity of indoor pollutants and their mixtures under changes in climate, changes in occupants (ages/disabilities), and changes in processes indoors (science labs, v kitchens, v gyms, v libraries, v paperless office) and the resulting impacts on occupants of homes, schools, and offices.</p> <p>It should also note, as did IOM Climate report in 2011, that indoor environmental exposures can be 100-1,000 times more intense than outdoor, and that there is sufficient science to support preventing indoor exposures. Currently, while US EPA has well-recognized expertise in indoor environments in homes and schools, its capacity to advance even voluntary prevention efforts in these sectors has been steeply curtailed by recent budget cuts.</p> <p>The chapter should expand on how climate change is expected to:</p> <p>1- significantly increase the amount of time children and adults</p>	Ch 3: Air Quality				<p>In regard to the first paragraph of the comment: Note that there is an entire chapter on vulnerable populations that has extensive coverage of children and health. There is also some coverage of children in Chapter 7, extreme events.</p> <p>We appreciate these suggestions, but space is limited and many of the points the commenter raises are beyond the scope of this chapter/report; however, children have been added as part of vulnerable populations in the air chapter.</p>

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		<p>spend indoors (IOM 2011); 2- how factors stemming from global warming will increase pollutants found in or introduced into the indoors (IOM 2011); 3- adversely impact the current poor Indoor Air Quality (IAQ) in K-12 schools and note the long-standing current lack of adequate state and local actions to improve IAQ in schools (EPA; CDC SHPPS 2012); and, 5- adversely impact school children who are without any system of environmental public health services when at risk or with environmental exposures while in k-12 schools or child care centers ("Towards Healthy Schools 2015"; J Paulson, "Who's In Charge", 2010; NACCHO Children's Environmental Health Policy).</p> <p>To be more fully addressed in this chapter: The lack of specific data on children's exposures to poor indoor air and other factors in k-12 schools needs to be noted and addressed (EPA ACE 2013). No data does not mean no problem; indeed the Assessment should note that data are needed in this critical area and EPA has recently offered research (STAR) and program grants (OCHP, IED-asthma) in this complex and under-valued field. Indeed, the Assessment cannot say it has addressed "children" unless it also addresses where 99% of all children ages 5-18 years old (also 3-5 and 18-21 for some special education students) are nearly every day - in school.</p> <p>Increases in ozone outside will also increase ozone indoors and will prompt chemical changes in building materials (foams, plastics, press board), adding to pollutant loads indoors. High heat and humidity outside will also increase indoor heat and humidity which in turn will also prompt changes in indoor air chemistry (IOM 2011), spurring more off-gassing of VOCs and more mold growth indoors.</p>					

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		<p>Increased levels of CO2 outside will result in increased levels indoors. Adult "executive functioning", ie, critical thinking skills, begin a steep decline at 1,000ppm CO2 (Spengler 2012), suggesting that both adult workers and children in classrooms where CO2 levels have been recorded approaching 5,000ppm (EPA; Blake, Northwest Air) will experience declines in attention, concentration, prioritization, alertness and the ability to organize tasks, all essential to learning and productivity.</p> <p>It also very clearly leads to the inevitable conclusion that every day some high risk children are being evaluated for special education services when in fact they need only healthy indoor air in occupied classrooms. School personnel rarely if ever address children's environmental health needs. For example, two surveys of school nurses (Healthy Schools Network, 2000, 2011) have found that school nurses know children impacted by poor IAQ in schools but also found that they are even more reluctant to discuss these exposures with parents than they are their own workplaces exposures with their principals.</p> <p>In addition, as the chapter already notes, asthma and allergens are expected to increase, increasing allergic diseases and asthma. The increases will result in more missed school days, which in turn will result in weaker academic achievement by school children, particularly those children already at risk due to poverty, poor health, or pre-existing health and learning impairments. Special needs are already on the rise and toxic exposures- indoors and outside, are linked with decreased IQ (Trousdale, et al, IDD 2010).</p> <p>Also note, section 3.5: IAQ and Health is NOT an "emerging topic", see Lawrence Berkeley IAQ Resource Bank, at http://www.iaqscience.lbl.gov/performance-summary.html, nor is</p>					

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		<p>climate and health. Also see Mendell, et al, Indoor Air, 2005.</p> <p>The IOM published a major report on Climate, the Indoor Environment and Health in 2011. The NRC (Green Schools, 2006) reported a "robust literature" in indoor environments in schools and children's environmental health, and as a result, recommended that "in the future", school should be designed to be clean, dry, quiet, free of dust and particulates, have good IAQ and thermal comfort. Find an accurate title.</p>					
Claire	Barnett	<p>9.1 key findings and 9.2 Introduction will need to be amended to reflect recommended changes below to subsections regarding children as a population of concern in context of climate.</p> <p>9.3.2. The agencies should recognize that all factors listed in the draft Assessment contribute to children's increased risks and exposures.</p> <p>Occupation: we recognize that children do not have "occupations", per se, but we also recognize that they are more vulnerable than the adults around them to environmental exposures (AAP, CDC, EPA, WHO, APHA, EO 130435), and that they are COMPELLED to occupy the same workplaces, often for as many hours and as many days as school and child care employees. In other words, the third grader is likely to have the same or greater exposures at school as his/her third grade teacher, who is not compelled by law to be in that workplace and who may have a bargaining contract, union support, and or access to occupational health clinical and support services, as well as the ability to call in a substitute (Towards Healthy Schools 2015; J Paulson 2010).</p> <p>Thus we recommend that a corrected Assessment develop a specific section treating "schools" as children's "workplaces", as distinct from adult workplaces. Currently, children have no</p>	Ch 9: Populations of Concern				<p>Thank you for a thoughtful comment related to the risks to the health of children from climate change. We have made various additions and changes to the text in Section 9.4.3 to incorporate many of your suggestions.</p> <p>We have added language to describe children's greater vulnerability than adults to some environmental exposures, especially in school buildings or child care facilities where they spend the majority of their time outside of the home.</p> <p>In addition, we agree that as centers for community activities, schools are often called upon to provide shelter and services during or after extreme weather events. Schools are mentioned as one of the factors that contribute to exposure in Section 9.3.3, particularly if in a risk-prone location.</p> <p>We have added language to describe how the impact of heat effects various child populations (including all young children, school age children, children who are involved in strenuous outdoor exercise or sports and disabled children).</p> <p>While we agree that opportunities exist for vulnerability mapping of relevant factors for</p>

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		<p>recourse from risks or exposures in schools/child care. When children are not at home, school is where they spend the most time. Our nation's 130,000 public and private schools (NCES) have special characteristics: the facilities are relatively expensive and hard to plan and to finance, and often the largest buildings in a community. They are the places where 99% of all children of school age are on any school day (NASN) and they serve as centers of community. Often they are called upon to shelter the community during or after a disaster. And they are already in poor condition (US GAO, American Society of Civil Engineers, NCES). The poorest children have the schools in the worst condition (GAO, IDD 2010) and the poorest are often at the highest risk of the effects of climate change (this Assessment).</p> <p>Time Spent in Risks Prone Locations: k- 12 schools nationwide are known to contain environmental health hazards (lead, mercury, PCBs, pests and pesticides, hazardous cleaning products, asbestos, growing molds, (EPA, others)) and to be in poor physical condition due to decades of deferred facility maintenance and repairs (GAO, 1995, NCES 2014, ASCE 2013)). Poor conditions can result from poor design and construction (EPA State School Guidelines, 2012), but the deferral of maintenance also contributes to leaking and or weak building envelopes (exterior shells: roofing, walls, doors/windows, foundations), poor sanitation and ventilation and lighting, lead contaminated drinking water, and vapor intrusions from unexamined and or unaddressed prior uses and or nearby hazards (EPA School Siting Guidelines, 2011).</p> <p>Displacement. School facilities (or any building for that matter) that are in poor condition are likely to be at greater risk of damage due to severe weather events. GAO and NCES have published on the need to rebuild school infrastructure. In the FFY12 and FFY13 years, FEMA spent an estimated \$7.5 Billion on school damaged by storms (CRS 2013).</p>					<p>children's exposures (e.g., child care and K-12 schools), we have not found a robust peer-reviewed literature on this issue. Thus, we have decided to capture this idea in our cross-cutting research needs regarding vulnerability mapping.</p>

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		<p>In addition, due to the damages to schools and communities, and the resulting physical relocation or displacement of children into new school systems, the US Dept. of Education spent another \$1.7 Billion to compensate schools for displaced students (CRS 2013). These statistics argue powerfully for this chapter to address children's special vulnerabilities when attending school/child care.</p> <p>Socio economic status. Proportionally there are more children in poverty today than 25 years ago (NCES 2013).</p> <p>Condition of Infrastructure. See comment above re risk prone locations. Moreover, during Super Storm Sandy, over 170 schools in the New York City area were IN OR ADJACENT TO the storm surge (NYS Education Dept/Office of Facilities Planning, 2012), and thus clearly at high risk for salt water and flood damage. Yet, the NYS Education Department issued a memo (Nov 6, 2012) to Superintendents regarding first, that the Commissioner could waive up to five days of the 180-day required days of school attendance, and then second, regarding when a school is "safe for reopening". There was no suggestion that schools should be inspected for structural damages or flood-borne pollutants such as gas, oil, and raw sewage. The Department recommended that schools were "safe to open" if they had "normal electrical power", "potable water and functioning toilets", and "communication capabilities". That was not a child protective response.</p> <p>Yet, in fact, just as after 9/11, after Hurricane Katrina/Rita, and after the BP Oil Spill, no federal, state or city health agency offered any child health protective guidance. It was documented that post 9/11 children were returned to contaminated schools ("Schools of Ground Zero: Early Lessons Learned in Children's Environmental Health", APHA, 2002) and later reported that NIOSH had</p>					

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		<p>conducted an evaluation of school personnel and found new onset illnesses among in the same schools occupied by children (2006 NIOSH HHE 2002-0090, 2002-0096, 2002-0101-3028). No entity then evaluated or intervened for school children. No data clearly does not mean no problem; it means that the agencies have a great deal research, policy and program work to do to begin to prevent harm to children before, during and after disasters. This should be reflected in the final Health Assessment.</p> <p>Compromised mobility, cognitive function, and other mental or behavioral factors. Children are not just "little adults" and will not be as mobile or have the same capacities as the adults around them. Children in k-12 schools are generally not mobile on their own: they are bused to school. There are more children with autism, Learning Disabilities, and asthma and other health and learning impairments than ten years ago (CDC 2015).</p> <p>9.4.3 We strongly recommend that EPA OCHP, advised by CDC NCEH, convene a new federal advisory working group of advocates, PEHSUS, and researchers, tasked with developing a beefed up health review delineating climate change risks to children where they live, learn, and play.</p> <p>Extreme Heat. Embarrassingly, this section focuses exclusively on student athletes participating in outdoor events, but omits a discussion of the impact of heat on children with chronic illnesses or on certain medications or indoors in un-airconditioned old brick schools. This section also omits any discussion of school age children and or children with disabilities.</p>					

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		<p>9.4.5 Occupational Groups. This is a great concept: work and workplaces that present risks, and a concept that needs to be applied to children in child care and in k-12 schools, the places they are compelled to spend the most time in when away from home. We strongly urge a revised health review develop an approach to children that captures the special biological risks and the "occupational" risks they encounter when sharing workplaces like schools with adult employees.</p> <p>9.5 and 9.6 Mapping and Vulnerability. Research. We encourage agencies to explore mapping of child care facilities and k-12 schools, along with the Socio-Economic and health factors of specific zip codes, to determine where vulnerable children may be at greatest risk. For example, in which zip codes are the worst pediatric asthma rates? In which zip codes are k-12 schools in the worst condition? Which zip codes have the lowest per capita incomes? Are those children and their schools geographically located in low income flood zones or high heat zones?</p> <p>New York State has sufficient reliable data sources for this kind of cross-agency, cross-issue mapping, but other states may not. To develop critical data, we strongly recommend that in the future pediatric electronic medical records (ages 3-21) contain the child's nationally unique school building identifier to help provide a data base for researchers, health providers, and agencies to assess and to prevent risks to children.</p>					
Julia	Gohlke	<p>This sentence is confusing.</p> <p>"...we are only able to describe changes in risk or exposure, while for others we can describe changes in actual health outcomes..."</p>	Executive Summary		2	35	The text has been revised for clarity.

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		<p>Should it read '.....risk of exposure"?</p> <p>Typically risk is defined as a probability, and risk of health outcomes would incorporate both exposure and changes in "actual health outcomes". I'm thinking the authors meant risk of exposure only for the first part of the sentence?</p>					
Nick	Higginbotham	<p>I wish to commend the Interagency Group on Climate Change and Human Health for this initiative to review the scientific literature on climate change-related health outcomes, including mental health. The potential value of this report for encouraging policy progress on this issue both within and outside of the United States is enormous.</p> <p>My comments are directed at the chapter on Mental Health and Wellbeing.</p> <p>Figure 1 encapsulates the chapter's dominant theme: to document how climate drivers (extreme weather events and 'natural' disasters) create damaging conditions and hardships (exposure pathways) leading to mental health sequelae (negative or positive).</p> <p>I would expect a chapter on mental health to give a bit more weight to how psychological processes of environmental threat appraisal, cognition and coping (adaptation) shape people's responses to global warming, including emotional reactions.</p>	Ch 8: Mental Health				<p>Thank you for your thoughtful comment. We appreciate the suggestion, but space is limited. The author group weighed the amount of discussion included in the chapter on specific mental health and wellness effects based on space limitations and the extent of available scientific research. We feel that the important considerations related to psychological processes that you identified are addressed in the threat of climate change section and in the third key finding.</p>

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		<p>Our research supports an ‘environmental/cognitive stress model,’ positing that climate change action begins with a direct (e.g. local drought) or indirect (media image) experience of global warming. A threat appraisal process is activated by this experience, and is influenced by whether the individual attributes the threat to a ‘natural cycle’ or is caused by human activities that need addressing.</p> <p>Following threat appraisal is coping appraisal, emotional response and, subsequently, problem-focused coping (including self and collective protection). (See Higginbotham, et al, 2014, figure 1).</p> <p>Our longitudinal data (n=1150) comparing respondents from farming and suburban lake areas in Australia found a marked decline in people’s observations of climate-related natural events (except hotter days), influenced by local weather conditions. However, residents felt very concerned about extreme weather events becoming more frequent in the future.</p> <p>Threatened climate impacts affecting household budgets remained constant and elevated perceptions across time. The dominant action in the face of climate threats clustered around daily conservation (e.g., reduce water/energy use) and money saving routines under personal or household control.</p> <p>We conclude residents’ perceptions and understandings are evolving dynamically across time, as they monitor a changing policy (local/national) environment, are exposed to the vicissitudes of climate change debates and experience highly variable weather patterns. National surveys often obscure respondents’ different</p>					

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		<p>exposures to their unique ‘micro’ climate zones and the diverse ecosystems to which they constantly must adapt.</p> <p>Long-term residents are agents within such ecosystems. Their climate change concerns (and well being generally) are mediated by their connections to local environment, their observations of environmental change and the personal experience of the weather.</p> <p>Our understanding of climate risk perceptions was informed by two earlier studies we completed on the nature of distress individual’s experience when they face unwelcomed environmental change.</p> <p>The first study (Connor et al, 2004) completed in-depth interviews with rural residents facing unprecedented landscape transformation from open-cut coal mining. It found such adverse environmental change was associated with significant expressions of distress linked to negative changes to interviewees’ sense of place, well-being and personal control. A new concept, ‘solastalgia,’ was introduced to help explain the relationship between ecosystem health, human health and powerlessness.</p> <p>The second study (Higginbotham, et al, 2006) validated a new index of the bio-psycho-social cost of ecosystem disturbance—the Environmental Distress Scale (EDS). The EDS combined dimensions of hazard perception, threat appraisal, felt impact of changes, ‘solastalgia,’ and environmental action. The EDS originally focused on disturbance caused by the mining industry. However, it has been adapted as a general tool to appraise the distress arising from people’s lived experience of the desolation of their home and environment, including climate change among the</p>					

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		<p>Inuit (Cunsolo Wilcox, et al., 2012) and Indonesian volcano disaster survivors (Warsini, et al., 2014).</p> <p>Our work, and related empirical investigations (Bradley, et al., 2014; Reser et al., 2015), indicates that psychological appraisal processes are central to understanding how mental health outcomes are affected by the threat of global warming. People inhabit and develop attachments to local ecosystems that sustain and give them personal and social identities. Climate change threats are observed, imagined and in various ways filtered through these attachments giving rise to feelings of impending loss and distress.</p> <p>References</p> <p>Higginbotham, N., Connor, L.H., Baker, F. (2014). Sub-regional differences in Australian climate risk perceptions: Coastal versus agricultural areas of the Hunter Valley, NSW. <i>Regional Environmental Change</i>, 14(2), 699-712.</p> <p>Connor, L.H., Albrecht, G., Higginbotham, N., Freeman, S., Smith, W. (2004). Environmental change and human health in Upper Hunter communities of NSW, Australia. <i>EchoHealth</i>, 1 (Supplement 2), 47-58.</p> <p>Higginbotham, N., Connor, L., Albrecht, G., Freeman, S., Agho, K. (2006). Validation of an Environmental Distress Scale. <i>EcoHealth</i>, Doi:10.1007/s10393-006-0069-x.</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>.....</p> <p>Bradley, G.L., et al. (2014). Distress and coping in response to climate change. In K. Kaniasty, et al. Stress and anxiety: Applications to social environmental threats, psychological wellbeing, occupational challenges, and developmental psychology. Berlin: Logos Verlag, 33-42.</p> <p>Cunsolo Wilcox, A., et al., (2012). From this place and of this place.” Climate change, sense of place, and health in Nunatsiavut, Canada. Social Science and Medicine, 75, 538-547.</p> <p>Reser, J.P., et al. (2015). Public risk perceptions, understandings and responses to climate change. In J.P. Palutikof et al. Applied Studies in Climate Adaptation. New York: John Wiley.</p> <p>Warsini, S., et al. (2014). Translation, cultural adaptation, and psychometric testing of the Environmental Distress Scale with Indonesian survivors of a volcanic eruption. Disaster Medicine and Public Health Preparedness, 8(3), 229-238.</p>					
Julia	Gohlke	As written, the term confounding factor is used incorrectly here. I suggest changing this to 'potential effect modifier,' since uptake of adaptation measures likely modify the strength of the association between extreme temperatures and health outcomes.	Ch 2: Temperature-Related Impacts		66	27	This change has been made as suggested.
Julia	Gohlke	Suggest changing 'premature child births' to 'preterm birth' to increase accuracy. Children aren't birthed and preterm is more specific to what is actually being measured (gestation length).	Ch 2: Temperature-Related Impacts		58	18	The text has been revised to incorporate this suggestion.

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Julia	Gohlke	<p>The review of literature examining associations between temperature and preterm birth could be more fleshed out. Currently, it is mentioned only on page 63, lines 3-5. This text suggests there is no consensus on mechanism. There is substantial literature linking dehydration to preterm labor. Dehydration is a well known sequelae of exposure to extreme heat. Other mechanisms proposed include a direct hypothalamic link between thermoregulation and endocrine centers involved in initiating labor as well as changing status of genitourinary infections (which are well-established causes of preterm labor). In addition to the studies mentioned conducted in California, Kent et al. 2014 found a significant association between preterm birth and extreme heat events in Alabama. Previous studies in New York and Illinois should also be reviewed (see citations below). Numerous additional studies exist including those conducted outside of the U.S. and could be reviewed to further clarify this section (e.g. see Alyssa et al. for review).</p> <p>Porter K.R., Thomas S.D., Whitman S. The relation of gestation length to short-term heat stress. <i>Am. J. Public Health.</i> 1999;89:1090–1092.</p> <p>Hirsch E., Lim C., Dobrez D., Adams M.G., Noble W. Meteorological factors and timing of the initiating event of human parturition. <i>Int. J. Biometeorol.</i> 2011</p> <p>Lajinian S., Hudson S., Applewhite L., Feldman J., Minkoff H.L. An association between the heat-humidity index and preterm labor and delivery: A preliminary analysis. <i>Am. J. Public Health.</i> 1997;87:1205–1207</p>	Ch 2: Temperat ure- Related Impacts				Text has been revised to address this comment.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>Alyssa J. Beltran, Jun Wu, Olivier Laurent. Associations of Meteorology with Adverse Pregnancy Outcomes: A Systematic Review of Preeclampsia, Preterm Birth and Birth Weight Int J Environ Res Public Health. 2014 January; 11(1): 91–172.</p> <p>Kent ST, McClure LA, Zaitchik BF, Smith TT, JM Gohlke. (2014). Heat Waves and Health Outcomes in Alabama (USA): The Importance of Heat Wave Definition. Environ Health Perspect. 122(2): 151-8</p>					
Julia	Gohlke	Note that availability and use of air conditioning is significantly higher in Southeast and could at least partly explain the reduced effect size (instead of physiological acclimation alone).	Ch 2: Temperature-Related Impacts		68	11	While the potential role of air conditioning is specifically discussed as part of the discussion of Key Finding 3 which is more relevant for this topic, the text has been revised to note some of these differences including the higher use and presence of AC in the Southeast.
Julia	Gohlke	For the adaptation discussion, it might be useful to note that effect estimates are relatively stable over the last 20 years in regions that have had 90-100% air conditioning availability versus those regions that have had increased availability of air conditioning over time.	Ch 2: Temperature-Related Impacts		70	8	The author team has determined the discussion of air conditioning is placed in the appropriate context in this section. No change has been made to the text.
Julia	Gohlke	Depending on the more thorough review of evidence for adverse birth outcomes suggested for the temperature chapter, it might be useful to include preterm birth in this list of outcomes.	Executive Summary		5	11	The text has been changed in the executive summary to match the findings of the Temperature-Related Deaths and Illness chapter. Please see Temperature-Related Death and Illness chapter for more specific information on this subject.
Joseph	Reser	<p>Response to public comment invitation with respect to The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment by Joseph Reser, 6 June 2015</p> <p>I have carefully read through the Executive Summary, Chapter 1, and Chapter 7 of The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment, along with several other chapters. The comments which follow are principally directed to Chapter 7, though with passing comment on the introductory sections of the Report. I write as an academic and</p>	Ch 7: Extreme Events				<p>We greatly appreciate your thoughtful comments. While the authors acknowledge that “extreme weather events” is a commonly used phrase in the social science literature, the author team decided on the use of “extreme events” as a more appropriate umbrella term for this chapter that includes weather-influenced events (for example, drought and wildfires).</p> <p>Due to the size of the topic, and the page limit</p>

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		<p>researcher, and as an environmental, social, and health psychologist, with considerable experience in the areas of human preparedness, response to, and the psychological and social impacts of, natural disasters and extreme weather events, as well as the broader domain of risk perception, communication, and management. My own research over the past eight years has been substantially focused on public risk perceptions, understandings, and adaptation responses to the threat of global climate change, with a particular focus on psychological adaptation processes and psychological impacts of particular relevance to health, experienced quality of life and environment, and issue and behavioural engagement. I have also informed myself of the nature, purpose, and content of the full draft report.</p> <p>I was initially struck by the language and framing of the chapter with respect to extreme events, rather than extreme weather events, or extreme weather events and natural disasters, given the climate change focus of the report, and the exceptionally strong focus on extreme weather events throughout the report. This choice of terms and predominant emphasis on ‘extreme events’ seems odd given that the language of climate change science, including social and behavioural science, popular science, media coverage, and public discourse utilises the language of extreme weather events and natural disasters. As well, the exemplars of these extreme events have also clearly been selected from a broader set of possibilities (heat waves, extreme cold snaps such as the polar vortex, tornados) with no explanation provided. If the language has been changed to accommodate the inclusion of phenomenon such as drought and wildfires which are not strictly extreme weather events, this convention would be clearer if stated and explained up front.</p> <p>Also, and very problematically in my view, very little distinction is made between extreme (weather) events and ‘climate change’, when, from an environmental risk perception or social science perspective, these are very different phenomena and risk domains. Extreme weather events and natural disasters are naturally occurring regional events and phenomena reflecting underlying natural processes and systems. Climate change on the other hand is a global alteration of atmospheric systems and climate patterns brought about or ‘forced’ by cumulative human carbon-generating</p>					<p>for the chapter, we focused on broad trends rather than delving too deeply into the mental health consequences of extreme events. We appreciate the suggestion; however, a more comprehensive coverage of the mental health consequences of extreme events has been addressed in the chapter on Mental Health and Well-being. We have added text to the discussion of adaptive capacity to include the role of emergency response and preparedness in increasing adaptive capacity at multiple levels (local, state, tribal, and federal).</p>

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		<p>activities. As such anthropogenic climate change reflects both human and natural causation, constituting a ‘hybrid’ or ‘embedded’ disaster (e.g., Bell et al., 2001; Boyarski & Schneiderman, 2002; McDaniels et al., 1996). Extreme weather events and natural disasters are typically acute, temporally limited events with clear beginning and end points. Global climate change is an ongoing (chronic) and increasingly consequential phenomenon, global environmental condition, and environmental stressor, and is not defined by or limited to human impacts or community disruption (e.g., Peek & Mileti, 2002; Quarantelli, 1998). Global climate change also appears to be a distinct ‘risk domain’ in terms of the collective accountability and responsibility associated with this human ‘forcing’, the global and much longer term implications climate change, it’s accruing and culturally imbued symbolic associations, and the dread risk, stigma, and uncertainty associated with hybrid disasters (e.g., Jaeger, Renn, Rosa & Webler, 2001; Pidgeon, Kasperson & Slovic, 2003; Slovic, 2000). See appended comparison Table 1.</p> <p>It is interesting that while the Report is entitled “The Impacts of Climate Change on Human Health in the United States”, with this being the focus notionally outlined in the Prospectus and the Introduction to the Report, the framing, prevailing emphasis, and the great majority of the content of the report is about extreme weather events and a very selective biomedical, public health focused examination and discussion of projected health impacts. Reference to the glossary in terms of understanding the difference in use of these terms is not particularly helpful. The specification and definition of climate change makes no reference to human-forced or anthropogenic climate change, unlike the more universally accepted Kyoto Framework Convention definition, and hence simply does not touch base with every day public discourse and understandings, popular science, popular culture, or media coverage. Yet this hybrid, anthropogenic character of climate change as a phenomenon, threat, and risk domain is integral to understanding public risk perceptions, appraisals and understandings; psychological and behavioural responses; and the health-related psychological and social impacts of both the threat of climate change and the current and projected physical environmental impacts of climate change, including changes in the</p>					

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		<p>frequency and intensity of extreme weather events and conditions. The definition of extreme events provided in the glossary clarifies that what is meant in the report is extreme weather events. However, and unfortunately, these extreme events are then used throughout the report as effectively synonymous with climate change when considering human health impacts. There are very few entries or definitions of constructs or terms in the glossary helpful to understanding the broader human health impacts of ‘climate change’.</p> <p>A very real issue here is that the meaning and compass of ‘climate change’ actually encompasses the global phenomenon, the ongoing threat and risk domain, the environmental stressor status of climate change, the associated and contested political, policy, social and environmental issues, the impacts and implications of climate change, etc.. Many of these aspects and meanings of climate change have very real health, and risk perception and communication implications, which are largely ignored in this chapter, as is the extensive body of social and behavioural science research which has addressed, usually separately, the broader psychological and social health impacts of natural disasters and extreme weather events, and the health-related psychological and social impacts of the ongoing threat and currently unfolding environmental impacts of global climate change. This is not to say that there is not, increasingly, a strong climate change signal in many extreme weather events for the American public, but the psychological (including behavioural) significance and influence of exposure to and experience of these two risk domains is arguably and empirically very different (e.g., Reser, Bradley, & Ellul, 2014).</p> <p>The chapter also has a very strong focus on the health impacts of projected future extreme events, and very little reference to the current and ongoing threat of climate change and the current health and well-being related psychological and social impacts of this unprecedented global threat. Indeed the chapter largely ignores the continuous environmental stressor status of this profound threat, the social construction and social representation of this threat and risk domain through multi-media coverage, public risk perceptions, appraisals, and understandings of climate change, as distinct from risk assessment (e.g., Evans & Lepore, 2008; Bell et al., 2001;</p>					

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		<p>Gifford, 2014; Reser & Swim, 2011). The exposure pathways in Figure ES1 (p 4), for example, make no reference to the contemporary information environment, indirect virtual and vicarious exposure and experience, or the ways in which the nature and risks of climate change are being socially represented, communicated, and understood (e.g., Joffe, 2003; Pettenger, 2007; Smith & Joffe, 2013).</p> <p>Social and behavioural science research over the past four decades has addressed, conceptualised, researched, and documented these processes and impacts relating to global environmental change and global climate change, and over a considerably longer period in the context of natural disasters and extreme weather events not attributed to global climate change, but often to global environmental change (e.g., the many National Research Council reports and publications addressing both natural disasters and climate change; the 2013 UNESCO and ISSC World Social Science Report; the 2010 Routledge Handbook of Climate Change and Society; the 2011 Special issue of the American Psychologist addressing climate change; the 2009 edited volume, Anthropology and Climate Change; the content of WIREs Climate Change journal, etc.). The listing of readily available social and behavioural science volumes, review articles, and journals addressing the health implications of human response to and the human impacts of natural disasters is simply far too extensive to attempt to practically capture and cite here. While the compass of chapter 7 is understandably constrained, it seems very remiss to have not referred to and at least situated the chapter 7 focus and coverage within this broader social and behavioural science research and application context, encompassing natural disaster prevention, preparedness, response and recovery on the one hand, and climate change risk perceptions, understandings, adaptation responses, and, crucially, health-related biomedical, psychological, and social impacts, on the other.</p> <p>Exceptionally little attention is given in the chapter to the psychological and non-clinical mental health and well-being impacts of the phenomenon, threat, and extreme event manifestations of climate change, and indeed reference to mental health impacts, clearly glossed as mental ill-health as distinct from</p>					

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		<p>mental health and well-being, itself comprises a very small percentage of the coverage in the chapter. This undoubtedly reflects initial decisions with respect to the way the chapter has been conceptualised and framed, the inclusion of chapter 8 and its remit in the Report, and the backgrounds and expertise of the chapter authors. This surprisingly selective coverage again effectively ignores a strong, encompassing, and highly relevant social and behavioural science body of work and expertise in the areas of natural disaster and extreme weather prevention, preparedness, response, and recovery (PPRR), and the extensive and highly relevant social and behavioural science risk and natural disaster perception, communication, and management literature, to say nothing of the psychosocial environmental impact assessment literature. Some reference to the relevance and extent of these very germane bodies of work not covered is surely essential in a chapter and report such as this. I would add that I have carefully read through chapter 8 of the full report, and while there exists modest coverage of more psychological considerations in this chapter, chapter 8 also reflects a predominant public health focus on extreme weather events and biophysical health and clinical-level mental ill-health, with very limited coverage of what many would consider to be the far more pervasive nonclinical health and well-being impacts of the phenomenon and threat of climate change. There is unfortunately little attempt to explain, address, and differentiate the respective coverage of these two intersecting and sequential chapters in the preceding chapter 7.</p> <p>A specific problem with the brief reference to ‘mental health’ considerations provided in chapter 7 (p 253) has to do with implied meanings. What is meant by “mental illness and stress disorders” in the text and in Table 1 and why this differentiation? This needs some parenthetical explanation and is very vague as it stands. The construct of environmental stressor in the definitions provided and environmental stress generally is also problematic and quite inadequate given the importance of these constructs to this chapter and the report as a whole (e.g., Bell et al., 2001; Evans & Cohen, 1987; Evans & Lepore, 2008; Stokols et al., 2009). Also why is there no reference to adverse but nonclinical psychological and well-being impacts which nonetheless constitute very real and consequential health impacts, including impacts from the ever-</p>					

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		<p>present and typically media-presented threat of climate change, but which do not equate with mental illness or disorders? While there is initial but fleeting reference to chapter 8, some clarifying and explanatory comment would contribute to a more balanced and contextualised approach in chapter 7.</p> <p>Similarly the definitions of exposure and vulnerability in the chapter make no reference to indirect exposure and experience through media coverage, or to vicarious exposure through known others or through empathic identification with victims in media coverage. Such indirect exposure to extreme events and natural disasters, increasingly attributed to climate change, can be very powerful and consequential, as has been repeatedly documented in the disaster and terrorism research literatures (e.g., Silver et al., 2005; Silver, Fischhoff, 2011). It does seem anomalous that these matters are not at least briefly canvassed and discussed. Sustained media coverage of such human tragedy has been strongly criticised, for the very reason that such indirect exposure and experience can have appreciable and adverse psychological impacts on viewing audiences, particularly when the risk is global and profoundly consequential and/or when media coverage of tragic human loss is excessive and continuous.</p> <p>Many of the observations on this chapter are, in fairness, very germane to the report as a whole, reflecting a very evident institutional focus and precedent in the context of this and past National Climate Assessment Reports. But it is certainly timely and arguably crucial to more fully acknowledge and incorporate multidisciplinary and transdisciplinary perspectives in such important monitoring and reporting exercises, with particular reference to the present surprising absence of social and behavioural sciences perspectives and research findings. It also seems that everything in the chapter is framed and covered at a very 'structures and systems', population, and public health level, with scant reference to individual or psychological level risk perception, vulnerability, or psychological or social impact factors, in the context of either extreme weather events or the ongoing threat of climate change. Similarly there is no reference to cultural and social processes and levels of analysis with respect to environmental risk construction, perception, understandings, and</p>					

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		<p>meaning systems.</p> <p>The statement is made in the second paragraph of the first page (p, 23, lines 13-15) that “The purpose of this assessment is to provide a comprehensive evidence-based, and, where possible, quantitative estimation of observed and projected climate change related health impacts in the United States.” This purpose would be seen to be far from achieved by most social and behavioural scientists reading this chapter and report, as a very substantial and convergent body of social and behavioural research findings relating to the psychological and social impacts of the threat of climate change is simply not considered, evaluated, or addressed, with the exception of the very modest coverage found in chapter 8. Ironically those research literatures notably omitted in chapter 7, addressing the “Impacts of Extreme Events on Human Health”, are the social and behavioural sciences based natural disaster and risk perception, communication, and management literatures, and the psychosocial impact assessment research literature in the context of natural disaster warnings and realised natural disaster events.</p> <p>The initial CBS news piece associated with the release of the Draft Report, and the accompanying picture of a medical officer holding out a stethoscope, in essence captures much of what many would see as a core problem with the current report and chapter 8, along with the statement, “Mr. Obama is aiming to put a spotlight on ways that climate change will have real impacts on the body, like more asthma attacks, allergic reactions, and injuries from extreme weather.”</p> <p>Brief listing of sources referred to</p> <p>Bell, P.A., Greene, T.C., Fisher, J.D., & Baum, A. (2001) Environmental psychology. Fifth edition. Mahwah, NJ: Lawrence Erlbaum.</p> <p>Boyerski, I. & Schneiderman, A. (2002) Natural and hibrid disasters – Causes, effects, and management. Topics in Emergency Medicine, 24 (3) 1-25.</p> <p>Crate, S.A. & Nuttall. M. (Eds) (2009) Anthropology and climate</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>change. Walnut Creek, CA: Left Coast Press.</p> <p>Doherty, T.J. & Clayton, S. (2011) The psychological impacts of global climate change. <i>American Psychologist</i>, 66 (4) 265-276.</p> <p>Evans, G.W. & Cohen, S. (1987) Environmental stress. In D. Stokols & I. Altman (Eds) <i>Handbook of environmental psychology</i> (Vol I, pp 571-610). New York: Wiley.</p> <p>Evans, G.W. & Lepore, S.J. (2008) Psychosocial processes linking the environment and mental health. In H. Freeman & S. Stansfeld (Eds) <i>The impact of the environment on psychiatric disorder</i> (pp 127-157). London, UK: Routledge.</p> <p>Gifford, R. (2014) <i>Environmental psychology: Principles and practice</i>. Fifth edition. Colville, WA: Optimal Books.</p> <p>ISSC and UNESCO (2013) <i>World Social Science Report 2013, Changing Global Environment</i>. Paris, France: UNESCO & International Social Science Council.</p> <p>Jaeger, C.C., Renn, O., Rosa, E.A., & Webler, T. (2001) <i>Risk, uncertainty, and rational action</i>. London: Earthscan.</p> <p>Joffe, H. (2003) Risk: From perception to social representation. <i>British Journal of Social Psychology</i>, 42, 55-73.</p> <p>Lever-Tracey, C., (Ed) (2010) <i>Routledge International Handbook of Climate Change and Society</i>. London: Routledge.</p> <p>McDaniels, T., Axelrod, L.J., & Slovic, P. (1996) Perceived ecological risks of global change. <i>Global Environmental Change</i>, 6 (2) 159-171.</p> <p>Peek, L.A. & Mileti, D.S. (2002) The history and future of disaster research. In R. B. Bechtel & A. Churchman (Eds) <i>Handbook of environmental psychology</i> (pp 511-524). NY: Wiley.</p>					

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		<p>Pettenger, M.E. (2007) The social construction of climate change. Burlington, VT: Ashgate Publishing Company.</p> <p>Pidgeon, N. F., Kaspersen, R. K., & Slovic, P. (2003). The social amplification of risk. Cambridge: Cambridge University Press.</p> <p>Quarantelli, E.L. (1998) What is a disaster. New York, NY: Routledge.</p> <p>Reser, J.P., Bradley, G.L. & Ellul, .C. (2014) Encountering climate change: ‘Seeing’ is more than ‘Believing’ Wiley Interdisciplinary Reviews: Climate Change, 5 (4) 521-537.</p> <p>Reser, J.P. & Swim, J.K. (2011) Adapting to and coping with the threat and impacts of climate change. American Psychologist, 66 (4) 277-289.</p> <p>Silver, R.C. & Fischhoff, B. (2011) What should we expect after the next attack? American Psychologist, 66 (6) 567-572.</p> <p>Silver, R.C., Poulin, M., Holman, E.A., McIntosh, D.N., Gil-Rivas, V., & Pizzaro, J. (2005) Exploring the myths of coping with a national trauma: A longitudinal study of responses to the September 11th terrorist attacks. In Y. Danieli, D. Brom, & J. Sills (Eds) The trauma of terrorism: Sharing knowledge and shared care: An international handbook. New York: The Haworth Press.</p> <p>Slovic, P. (2010). The feeling of risk. London, England: Earthscan.</p> <p>Slovic, P. (2000). The perception of risk. London, England: Earthscan.</p>					

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		<p>Smith, N. W. & Joffe, H. (2013). How the public engages with global warming: A social representations approach. <i>Public Understanding of Science</i>, 22 (1) 16-32.</p> <p>Stokols, D., Misra, S., Runnerstrom, G., & Hipp, J.A. (2009) Psychology in an age of ecological crisis: From personal angst to collective action. <i>American Psychologist</i>, 64 (3) 181-193.</p> <p>Swim, J. K., P. C. Stern, T. J. Doherty, S. Clayton, J. P. Reser, E. U. Weber, R. Gifford, and G.S. Howard (2011) Psychology's contributions to understanding and addressing global climate change. <i>American Psychologist</i>, 66, 241-328, doi:10.1037/a0023220</p> <p>Table 1: Comparison of 'Climate Change' and Extreme Weather Events (Reser & Bradley, 2015)</p> <p>Characteristics Climate Change Extreme Weather Event/Condition</p> <p>Status Phenomenon, threat, unfolding biophysical impacts, global environmental condition, disaster, risk domain, ongoing environmental stressor Discrete event, possible regional disaster, risk domain, acute environmental stressor</p> <p>Reach, scale Global Local, regional</p> <p>Consequences, Implications Profound, possibly catastrophic Local, contained, typically modest</p> <p>Complexity Very complex, abstract, wicked problem Relatively</p>					

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		<p>simple, concrete, comprehensible</p> <p>Issue salience and importance Very high and ongoing Modest and intermittent</p> <p>Cultural significance, meanings, and symbolic associations High, with noteworthy dread risk, unfamiliarity, likely high mortality, and existential implications, still dynamic cultural meanings and associations, still developing cultural adaptations High, relatively familiar in specific regions, well-developed cultural meanings and associations, normalised risk domain, well developed cultural adaptations</p> <p>Certainty of presence, manifestations, impacts Considerable uncertainty Far less uncertainty</p> <p>Temporal nature and duration Ongoing, possible duration may be millennia Acute, clear start and finish, with exception of drought</p> <p>Predictability Unpredictable Predictable</p> <p>Causation Human plus natural causes, though human forced, therefore hybrid status Natural causes, though human actions can increase exposure and vulnerability</p> <p>Familiarity Low High</p> <p>Exposure (objective) Variable, global Variable, global</p> <p>Exposure (subjective) Moderate to high Moderate to high</p> <p>Exposure (virtual) High and constant Infrequent</p> <p>Vulnerability (objective) High and constant Infrequent</p> <p>Vulnerability (subjective) High and constant Moderate to low, and occasional</p> <p>Availability (Kahneman) High High</p>					

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		<p>Objective knowledge (public) Modest Good</p> <p>Subjective knowledge (public) Moderate Good</p> <p>Scientific understanding Extensive and rapidly increasing Excellent and only modestly increasing</p> <p>Preparedness Poor Moderate</p> <p>Media coverage High, global, ongoing, contested, sensationalised High, local, fleeting, not typically contested or hyped</p> <p>This table is appearing in a submitted article under review, and is currently under revision.</p>					
Julia	Gohlke	<p>I suggest re-considering the title of this section as 'confounding factors'. It would be useful to distinguish effect modification from confounding for the air pollution example. See for example:</p> <p>Analitis A, Michelozzi P, D'Ippoliti D, De'Donato F, Menne B, Matthies F, Atkinson RW, Iñiguez C, Basagaña X, Schneider A, Lefranc A, Paldy A, Bisanti L, Katsouyanni K. Effects of heat waves on mortality: effect modification and confounding by air pollutants. <i>Epidemiology</i>. 2014 Jan;25(1):15-22.</p> <p>Also the other example given (mortality displacement)--could population age structure be thought of as an effect modifier as well?</p>	Ch 2: Temperature-Related Impacts		56	16	The title has been modified and the citation has been added to the section.
Julia	Gohlke	<p>Consider including a discussion on potential differences between urban and rural populations. This discussion could be mentioned in the urban discussion on pg. 60 and/or on research gaps section starting on page 65. Projections presented starting on page 58 and highlighted in figure 3 focus only on cities. Some recent studies have evaluated rural/urban differences. A national study on ER</p>	Ch 2: Temperature-Related Impacts				<p>There is emerging evidence regarding high rates of heat-related illness in rural areas (Hess et al., 2014, Lippmann et al., 2013). Occupational exposure and lack of access to air conditioning are speculated to be some of the factors that may make rural populations</p>

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		<p>visits indicates higher rates of heat related illness in rural counties (Hess et al. below). Some additional examples in North Carolina, Florida, Georgia, and Alabama are below. I believe this has also be examined in California. Urban/rural comparisons are important for determining the extent one can generalize findings in cities and might also be useful for teasing apart air pollution/heat effects and adaptation effects such as cooling centers (primarily in cities), time to health care access, and occupation related effects.</p> <p>Hess JJ, Saha S, Luber G. 2014. Summertime acute heat illness in U.S. emergency departments from 2006 through 2010: analysis of a nationally representative sample. Environ Health Perspect 122:1209–1215</p> <p>Lippmann SJ1, Fuhrmann CM, Waller AE, Richardson DB. Ambient temperature and emergency department visits for heat-related illness in North Carolina, 2007-2008. Environ Res. 2013 Jul;124:35-42.</p> <p>Pillai SK1, Noe RS, Murphy MW, Vaidyanathan A, Young R, Kieszak S, Freymann G, Smith W, Drenzek C, Lewis L, Wolkin AF. Heat illness: predictors of hospital admissions among emergency department visits-Georgia, 2002-2008.J Community Health. 2014 Feb;39(1):90-8.</p> <p>http://www.floridahealth.gov/environmental-health/occupational-health-surveillance/_documents/heat-related-illness-all.pdf</p>					<p>particularly susceptible to extreme heat. Text has been added to address this issue.</p>

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		Crider KG, Maples EH, Gohlke JM. Incorporating occupational risk in heat stress vulnerability mapping. J Environ Health. 2014 Jul-Aug;77(1):16-22. Kent ST1, McClure LA, Zaitchik BF, Smith TT, Gohlke JM. Heat waves and health outcomes in Alabama (USA): the importance of heat wave definition. Environ Health Perspect. 2014 Feb;122(2):151-8.					
Joseph	Mattia	There are also areas that have had decreases in the length of ragweed season, an explanation of these fluctuations would be useful. For example, relatively in the same area of Oklahoma there has been a 2 week increase in rag weed season, but a decrease of a day very close to it.	Ch 3: Air Quality	Figure 4	120		The decrease given for Oklahoma City is not significant; the overall trend is for greater ragweed season as a function of latitude, which is consistent with IPCC projections.
Joseph	Mattia	Explanation of this chart would be very helpful to see. Such things as why the northwest won't really see a big impact, but the Midwest will see a substantial increase in the ozone related deaths	Ch 3: Air Quality	Figure 3	119		The text has been revised to incorporate this suggestion. In particular, the interpretation of the chart has been expanded. However, due to the size of the topic, and the page limit for the chapter, we focused on broad information rather than delving too deeply and providing such a level of specificity.
Joseph	Mattia	There are 2 different GCM's used here, but which one is more likely to happen. Also it seems as is southern California and Arizona will see a big increase in premature deaths related to ozone regardless of what model plays out. I would imagine because the increase temperature and high amount of population in that area leads to higher ozone formation. However, even in the model where they have lower increases of ozone than other parts of the country they have a higher increase in deaths. A solid explanation of this would really make this image much more useful.	Ch 3: Air Quality	Figure 2	118		Due to the size of the topic, and the page limit for the chapter, we focused on broad information rather than delving too deeply and providing such a level of specificity. Neither scenario is more likely than the other.
Joseph	Mattia	Numbers on the so called flattening out of asthma in citizens would be good to see real figures. Also, if numbers are up all around the country this should show even if those rates decrease in their growing rate it is still a problem. The goal should be to see those numbers decrease not just increase slower.	Ch 3: Air Quality		104	20	Point well made. But, we have not included additional language on this topic.

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Joseph	Mattia	For indoor air temperature to continue to be maintained at comfortable levels since there will be higher average outdoor temperatures that means people will use more energy to cool their homes. This would cause some sort of cycle of people using more energy to cool homes, which of course burns more energy which drives the formation of ozone thus leading to higher temps. Would be interesting to see exactly how that effect will impact the environment, since a continuous need of cooling a home leads to more energy use which makes more ozone meaning more cooling again.	Ch 3: Air Quality		97	31	The points the comment raises are beyond the scope of this chapter/report.
Joseph	Mattia	The increase in allergens is something that is currently hitting the east coast particularly hard. My allergies normally aren't bad in fact they rarely bother me, but this season has been a different story. If I have minor allergies that are acting up I can only imagine those with bad ones are having it pretty rough.	Ch 3: Air Quality		94	31	No change has been made.
Joseph	Mattia	Growing up in an urban city I noticed as a kid a lot of my friends had asthma, always thought it was just genetics at work, but the prevalence of it is clearly a symptom of the bad air quality in big cities. Something needs to be done with the poor air quality in big cities, a huge amount of children are being negatively affected by it.	Ch 3: Air Quality		91	33	This comment does not seem to raise any question or suggest any revision.
Joseph	Mattia	It would be nice if you state how much these emissions will decrease, I wonder how strict nationwide environmental regulations would be needed to really ensure they go down. The idea then is will this decrease in emissions offset the new ozone that will be formed by more favored weather conditions, this must be taken into account when choosing new emission standards. If not, a bigger decrease would be needed since ozone formation would be happening more naturally and we would have to halt that.	Ch 3: Air Quality		89	32	Due to the size of the topic, and the page limit for the chapter, we focused on climate/health impacts rather than delving too deeply or providing such a level of specificity. We have provided references to various future ozone precursor emissions projections (e.g., EPA 2012).
Joseph	Selinger	The chapter on vector borne disease that I read alerted me to many things that I was not aware of. The prevalence and location of West Nile Virus and Lymes disease in particular stood out to me. Typically thought of as disease you get from being outdoors and in forested areas I never thought about the threat that I may face by living in a city in the northeast. While I have never have had Lymes disease I have had close family members be stricken with it on several occasions. I would have liked to see the report expand on incidence of Lymes disease to see if there are multiple people reported getting it consecutively. The experience I have with	Ch 4: Vectorborne Diseases				Thank you for your comment; however, policy issues and more detailed discussions of incidence are beyond the defined scope of the Climate and Health Assessment, a scientific document that provides the basis for decision making, but does not address policy.

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		<p>Lymes disease is that when people get it they tend to be more prone to getting it again. I also found it interesting that being male is a risk for having more severe symptoms associated with the disease. It was a surprise as well to learn that West Nile Virus had only been introduced into the United States 16 years ago. With the lack of longitudinal studies and data for the United States one would think that data from other countries would be useful in projecting how to handle or predict outbreaks or vector concentrations. If the data from other countries is not suitable because of geographic and demographic reasons at least the incidence of occurrence would be useful.</p> <p>While Lymes disease is not as much a threat to cityscapes as West Nile it is still something that rats carry and there are plenty of rodent hosts in Philadelphia. My main concern after reading this report was how much non-climate related variables can influence transmission. To hear that only a few miles over the border in Mexico was a epidemic of Dengue fever reaching up to 67,000 cases where Texas had less than 70. Living in a city that has a large population at and below the poverty line makes me worry about the safety of our population and they may not even no they are at risk. The reasons cited for the mass difference in infections between Texas and Mexico was only a few things that we take for granted. For example screen windows and doors without holes in them, air conditioning and basic sewage are all things that prevent vector to human transmission. There should be awareness spread to not just areas that are rural or more wooded but also to cities to maintain intact window screens, reduce standing bodies of water and reporting any signs or symptoms of unusual weakness immediately.</p>					
Kavitha	Krishnan	<p>Yes, increased temperatures are associated with various diseases, but this is a strong statement that can be interpreted incorrectly. For example, multiple factors are associated with cardiovascular disease such as age, race, diet, and health status. It wouldn't hurt to make this point clear as you explain that temperature is a factor related to various diseases. We are also unsure how much of a role it plays, given the information you've provided. What does association mean?</p>	Executive Summary		5	12	<p>The executive summary is meant to be a high level summary of the report. Please see the Temperature-Related Death and Illness chapter for more specific information on this subject, and the Introduction chapter for how social determinants of health and other non-climate change related factors play a role in health outcomes.</p>

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Crystal	Perez	The first two sentences of this paragraph appear to be a bit disconnected from the third sentence. The points are all valid but the authors jump from the example of increasing temperatures resulting in increased deaths due to heat and decreased deaths due to cold to the point of hotter days AND colder days lead to higher levels of illness and death.	Executive Summary		5	2	The text has been changed in the executive summary to match the findings of the chapter on extreme temperatures. The Executive Summary is meant to provide a brief overview of the chapter findings. More information can be found in the underlying chapter on extreme temperature.
Crystal	Perez	If prolonged exposure to high temperatures can lead to increased hospital admissions, can prolonged exposure to low temperatures also lead to increased hospital admissions?	Executive Summary		5	12	Please see Temperature-Related Deaths and Illness chapter for more specific information on this subject.
Kavitha	Krishnan	You state that increased greenhouse gases lead to a decrease in deaths from cold and an increase in deaths from the heat. Immediately after, you discuss how hot and cold temperatures are related to increased deaths. These facts are valid but are disjointed. My train of thought was thrown off.	Executive Summary		5	3	Thank you for the comment, but the authors have decided to keep this text in the Executive Summary to provide a brief overview of the chapter findings. More information can be found in the chapter on Extreme Temperature.
Kavitha	Krishnan	I was expecting to see citations for the facts that were given.	Executive Summary		7	4	Please see underlying chapters for citations. The Executive Summary is a summary of the chapter findings, which are all referenced appropriately.
Kavitha	Krishnan	This logical thought process seems risky when you are using data from different studies that do not have high confidence levels. It can turn into an unreliable slippery slope if you only have medium confidence intervals for the statement that elevated surface temperatures are related to increased water contaminates. You then must take into account the confidence levels of the other relationships that are stated after it. Multiplied together, the overall scenario may turn out to be pretty unlikely.	Executive Summary		13	19	All Key findings and traceable accounts have been reviewed and revised to ensure proper use of confidence and likelihood language, as set forth in author guidance.
Crystal	Perez	The information here makes sense, however, correlating an increase in pests, microbes, and parasites to an increase in use of pesticides is a bit strong. Didn't the USDA do studies demonstrating an increase in genetic engineering of pest-resistant crops leading to a decrease in use of pesticides? On that note, I can also see the potential of increasing pesticide use to deal with pesticide resistant pests. This could also be partly attributed to climate and environmental changes...	Executive Summary		13	21	Please see the chapter on food safety for more information and the underlying citations behind the projected increases in pesticide use.
Kavitha	Krishnan	The words "death", "injury", and "illness" are vague terms when describing the adverse health outcomes from climate change. If it feels too general, I have trouble taking it as fact.	Executive Summary		15	18	Please see the chapter on Extreme Events for more explicit summations of health impacts

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							based on the findings of the supporting literature.
Gregory	Scott	<p>After reading the USGCRP Climate and Health Assessment for 2015, I have found the section on Extreme Weather to be of concern. It seems to my understanding that this report mentions mental health as a side effect or possible consequence of extreme weather events. While looking further into this article, it soon became apparent that there is a lack of research on the link between extreme weather events and the mental health status of the storm's victims. Moreover, I think it may be beneficial if the study were not only in regards to this chapter, but to also look at how areas might not only improve their infrastructures in ways to mitigate these disasters, but to also look at what mental health resources were and are currently available to those whom endure these tragedies. Perhaps to interview, and or analyze case workers and other mental health professionals whom were on seen at the recent flooding in Texas or those who have suffered after Super Storm Sandy or Hurricane Katrina? Even though there was a standalone section on mental health, I think extreme events may have greater similarities to post traumatic stress disorder, then that of structural cumulative damage of at risk populations in terms of climate change. The reason for this comparison is that a major storm event is one singular traumatic event, and can be seen as a categorically different type of stressor upon a person's psyche. This is the one area of research that I believe could be improved upon in terms of the chapter on extreme storm events.</p>	Ch 7: Extreme Events				<p>We appreciate the suggestion. Due to the size of the topic of extreme events, and the page limit for the chapter, we focused on broad trends rather than delving too deeply into the mental health consequences of these events. While we do include mention of mental health consequences throughout the chapter, we refer those interested in a deeper treatment of the topic to the chapter on Mental Health & Well-being. No change has been made to the text.</p>
Morgan	Garcia	<p>Climate factors and variables are difficult to compare in terms of interaction with vectorborne disease. This comparison is highly complex, as it draws largely on predicted models and data from previous seasons. Additionally, the multifactorial analysis of human disease and climate as well as vectorborne disease and human behavior is largely under-researched and not well understood. These issues make Chapter 4: Vectorborne Diseases a difficult chapter to present. It is clear that to better understand the data presented in this chapter, more information is needed so that a broader audience can understand the given implications.</p>	Ch 4: Vectorborne Diseases				<p>The authors appreciate the thoughtful comment and suggestions for improving the chapter. A summary of the comments together with their corresponding responses follow:</p> <p>(1) A change to the chapter that could potentially prove helpful would be the inclusion of an explanation or diagram illustrating how the modeled predictions actually work.</p> <p>Response: A number of different modeling studies have been published, and it is difficult to visualize how all of these models might be demonstrated in a figure. As an alternative,</p>

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		<p>A change to the chapter that could potentially prove helpful would be the inclusion of an explanation or diagram illustrating how the modeled predictions actually work. Throughout the chapter, the predictions or models used to obtain the data are alluded to several times. In the Introduction section, the analysis of the unpredictability of the models provides essential information. However, without understanding how these predictions are made, it is impossible to fully understand the implications given by the data. A diagram with this information and its reliability could prove invaluable. Additionally, it is clear that there is more research needed on vectorborne disease in general. This information is critical, but lacking, and this fact should be stated clearly in the very beginning of the chapter (such as in the Introduction). The State of Science section does a good job of explaining the relevant research on the diseases, but the fact that information is largely lacking should still be presented immediately in the chapter so that readers can gain a better understanding of why the predictions for vectorborne diseases are so difficult.</p> <p>The use of diagrams and other illustrations are exceptional, and provide readers with a useful visual device for understanding more technical processes. All sections in the report could benefit from the use of more visuals. Another suggestion for a visual would be a “What If” section that gave the solutions or procedures used in the event that one or more of the key findings came to be. For example, if West Nile became more prevalent such as in Key Finding 3, how would the CDC (or government in general) react to prevent further spread of the virus and provide therapy (in the form of vaccinations, medications, etc.) to those infected with the virus? Additionally, how is the government going to protect vulnerable populations, especially because of the disparity in access to healthcare?</p>					<p>Figure 1 was developed in an effort to show the various ways climate change may affect vectorborne diseases and how these factors interact.</p> <p>(2) Additionally, it is clear that there is more research needed on vectorborne disease in general. This information is critical, but lacking, and this fact should be stated clearly in the very beginning of the chapter. Response: Rather than discussing this need in the chapter introduction, the chapter is organized so that research needs are discussed in a separate section of our chapter – 4.7.</p> <p>(3). Additionally, how is the government going to protect vulnerable populations, especially because of the disparity in access to healthcare? Response: The comment is appreciated and valued, but policy issues are beyond the defined scope of the Climate and Health Assessment, a scientific document that provides the basis for decision making, but does not address policy.</p> <p>(4) Malaria should be discussed in the Emergence of New Vectorborne Pathogens section. Response: Malaria was endemic previously in the U.S. but was eradicated through sanitation and public health measures such as draining swamps, raising and lowering water levels of lakes through dams, larvaciding, the use of screens and air conditioning, and treating patients. Consequently, the authors did not feel that it was a good example to use in this chapter nor that malaria is of significant concern for re-emergence.</p>

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		A final comment to note about the chapter on vectorborne diseases, relates to the discussion of emerging and re-emerging vectorborne pathogens. As increasing global-trade and travel are cited as causes for this potential issue, I believe that Malaria should be discussed in the Emergence of New Vectorborne Pathogens section. It is known that almost all cases of Malaria are acquired from abroad, so Malaria is an extremely relevant vectorborne disease. This demonstrates the need for Malaria to be analyzed for possible implications due to climate change in order to provide a comprehensive overview of vectorborne diseases.					
Eric	Peterson	<p>In "Winter mortality in a warming climate: a reassessment", Ebi and Mills suggest that the observed spikes in mortality may be associated with episodes of cold dry air rather than extreme cold. The text on page 60 is speculative, suggesting that a reduction in extreme cold from "climate warming" may not lead to reduction in winter mortality. The authors on page 60 have failed to consider that "climate warming" will also lead to a reduction in "cold dry episodes", not just extreme cold. In the analysis of Ebi and Mills, which is based somewhat on Kinney (the other reference on page 60), their sole focus on extreme cold is misplaced.</p> <p>In short they have not considered the reduction in cold dry episodes. This is a well known result of global warming, see for example, "WATER VAPOR FEEDBACK AND GLOBAL WARMING" by Held and Soden, 2000 Annu. Rev. Energy Environ. 2000. 25:441–75 http://www.clidyn.ethz.ch/ese101/Papers/held00a.pdf</p>	Ch 2: Temperature-Related Impacts		60	8	Additional references and discussion of this topic have been included although the specific identified reference from Held and Soden is not specifically addressed.
Eric	Peterson	<p>Conclusion is unwarranted given previous speculation on lack of winter death reduction by ignoring rises in absolute humidity under "climate warming".</p> <p>Furthermore there is no support given for a change in summer mortality displacement. Thus there is ample reason to expect that summer mortality will continue to remain 10-15% less than winter</p>	Ch 2: Temperature-Related Impacts		61	22	The author team disagrees with the comment's conclusion and determined that our conclusion regarding the net sign of the change in future temperature-attributable mortality as a result of climate change accurately reflects the cumulative body of available published evidence. No change has been made to the text.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		mortality for all combined causes. Thus any reduction in winter mortality by increases in humidity will result in a net positive result for human health in temperate regions (i.e. those areas with large seasonal climate changes).					
Eric	Peterson	Key Finding is unjustified. Key finding repeated in executive summary is likewise unjustified. The authors and their referred authors have failed to consider the well supported projected increase in absolute humidity in winter (see Held and Soden, Annu. Rev. Energy Environ. 2000. 25:441–75) that will lead to reductions in winter mortality from most respiratory and some other causes.	Ch 2: Temperature-Related Impacts		66	13	The author team disagrees with the comment’s conclusion and determined that our conclusion regarding the net sign of the change in future temperature-attributable mortality as a result of climate change accurately reflects the cumulative body of available published evidence. No change has been made to the text.
Adam	Spanier	<p>Overall the report is well-written, well-documented and well-presented. I was pleased that an entire chapter (Chapter 9) focused on specific populations of concern. However, Chapter 9 is essential to understanding of specific populations of concern, and the authors should consider placing it earlier in the report (before chapter 2 please).</p> <p>Throughout the report there is a reference to “age” as a factor in vulnerability , but this reference is vague. and imprecise and inconsistent use of terms to describe “child” populations of concern. There is a need for the report to more clearly delineate health risks for three related vulnerable populations: pregnant women, the developing fetus, and children.</p> <p>In addition to specificity for age, children differ from adults in many ways due to their developmental stages. For physical development, it is important to highlight differences in organ development and function, as well as the role of metabolism and excretion at developmental stages and how this may increase the risk from climate change. These differences can increase: 1) exposures and physiological responses to airborne and waterborne toxins, 2) the impacts from excessive heat exposure, and 3) susceptibility to infectious disease (including vector borne diseases). There is also a need to address the dependence of</p>					<p>After consideration of this point, we still feel the existing order of chapters is clear and appropriate for our audiences. Each chapter leading up to the chapter on Populations of Concern has a populations of concern section, and this culminates in the last chapter of the report. The report, and particularly the section on children and pregnant women in the Populations of Concern chapter, has been reviewed and revised to ensure clarity in terms of where peer reviewed literature supports specificity of impacts by age. Please see this same section for specific assessment of literature on children’s vulnerabilities.</p>

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		children upon adults to secure their safety in extreme weather events. The risks associated with child-specific behaviors such as hand to mouth activity, crawling on ground and time in contained environments such as schools and day care settings should also be addressed specifically.					
Robert	Vanderslice	<p>USGCRP The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment.</p> <p>Executive Summary</p> <p>Page 2, Line 28. This list of vulnerable populations is fairly comprehensive, but neglected to include those living in social isolation. In addition, while it is important to list the factors that make people vulnerable, isn't it equally important to list the factors that protect these vulnerable populations from climate effects?</p> <p>Page 8, Figure ES3. The colors used for changes in ozone concentrations are confusing. For the other maps, blue is used to show areas of decrease, with the greatest decreases showing the darker shades of blue. For ozone, light blue is used to denote an increase in concentrations, but the color choice misleads the reader to thinking these are areas of decreasing levels.</p>	Executive Summary				The text on vulnerable populations has been revised to clarify and match the populations outlined in the chapter on Populations of Concern. This list is not meant to be comprehensive, and the authors felt it was best to be consistent with the chapter on Populations of Concern. Please see this chapter for more information on populations living in social isolation. The assessment of non-climate impacts on health (both positive and negative) are described in the Front Matter. All figures in the final report have been reviewed and edited to meet graphic design and layout formats. See chapter 3 (underlying chapter) for revisions to the ozone figure.
Justin	G.	"mosquitos" is misspelled.	Executive Summary		2	14	While both spellings (mosquitos and mosquitoes) are correct, the report has been revised to ensure consistency.
Robert	Vanderslice	<p>June 8, 2015</p> <p>USGCRP The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment. Available online: http://www.globalchange.gov/health-assessment</p> <p>Public comment period ends June 8, 2015</p> <p>Draft comments below prepared by Robert Vanderslice, PhD, Senior Director, Environmental Health Services, the Association of State and Territorial Health Officials (ASTHO).</p>					We greatly appreciate your positive comment about our report and hope that you find the content useful. While detailed discussions of climate mitigation, adaptation, or economic valuation and discussions of policy issues are beyond the scope of this report, The Introduction chapter and chapter on Populations of Concern outline the factors beyond changes in exposure that lead to more or less vulnerability, including changes in adaptive capacity and sensitivity. The Introduction chapter also notes the non-climate-change related factors that play a role in determining health outcomes. The entire

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		<p>General comments:</p> <p>On behalf of the environmental health national program office staff of the Association of State and Territorial Health Officials, I am pleased to submit to you for your consideration my comments as you move to finalize the April 7, 2015 draft USGCRP Climate and Health Assessment Report. As background, ASTHO is the national nonprofit organization representing public health agencies in the United States, the U.S. Territories, and the District of Columbia, and over 100,000 public health professionals these agencies employ. ASTHO members, the chief health officials of these jurisdictions, formulate and influence sound public health policy and ensure excellence in state-based public health practice. ASTHO's primary function is to track, evaluate, and advise members on the impact and formation of public or private health policy which may affect them and to provide them with guidance and technical assistance on improving the nation's health. ASTHO supports the widespread scientific consensus that the world's climate is changing, and that climate change has significant impact on human health. Climate change will threaten the basic life systems on which we depend: our water, food, air and shelter. Health effects related to climate change include death and illness from heat waves, injuries from extreme weather events, increased air pollution with concomitant rises in respiratory and cardiovascular diseases, water shortages and an increased incidence of vector- and water-borne diseases. Furthermore, ASTHO supports action to adequately bolster our nation's public health infrastructure to reduce the damage caused by climate change and prepare for future challenges (Climate Change Threatens Public Health Position Statement, July 2011; http://www.astho.org/Policy-and-Position-Statements/Position-Statement-on-Climate-Change-and-Public-Health/).</p> <p>Numerous aspects of the document are praiseworthy:</p> <ul style="list-style-type: none"> • The document is credible. Statements are supported by published studies. Expertise is used to distinguish between scientific 					<p>report has been reviewed and revised to ensure that where the literature supports it, language has been included that describe environmental conditions or where one lives as a factor that makes one more or less vulnerable to the different health impacts. Under-reporting and disease surveillance are covered in The Introduction chapter, as it applies to multiple chapters that follow, and more information on uncertainty in surveillance can be found in the Technical Support Document (Appendix) and a new figure on uncertainty in both the Introduction chapter and the Technical Support Document.</p> <p>All figures have been reviewed and revised in accordance with the graphic design and layout format of the final report.</p> <p>Regarding Temperature-Related Death and Illness chapter comments, a discussion of where people live is discussed in the chapter text. After consideration of this point, the author team determined that the existing text on page 53 is relevant. The text on page 63 has been revised to incorporate this suggestion.</p> <p>In regards to Figure 3, an additional map that extends the results to address entire states is beyond the scope of this chapter.</p> <p>Regarding Air Quality Impacts chapter comments, the section has been revised to more clearly reflect that exposure to higher ozone levels usually occurs outdoors. Space limitations preclude a more extensive discussion.</p> <p>In regards to comments for Vectorborne Disease chapter, responses to this comment have been broken into sections:</p>

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>consensus and uncertainty.</p> <ul style="list-style-type: none"> • The document is accessible to readers with a broad range of backgrounds. Jargon is avoided. Confusing or detailed information about scientific issues/debates is placed at the end of chapters, allowing the reader access to important information without interrupting the flow of the chapter. • The document gives the reader an appreciation for the complexity of issues that are cross-cutting. • Mental health impacts are extensively described and include impacts on emergency response workers <p>The document does not include some issues/concepts that would help inform policy:</p> <ul style="list-style-type: none"> • Discussions of vulnerability cover important factors that make populations more vulnerable. It would also be useful to include factors which are protective, especially those measures that can be implemented that make vulnerable populations less vulnerable with the end game of ultimately achieving optimal health for all. • Where people live has important consequences for their health. This is clearly identified in Chapter 9, Key Finding 4, but is largely absent from the other chapters. Each chapter identifies vulnerable populations or populations of concern, but rarely mentions the environment where people live as a risk factor. • The important issue of drought deserves more attention. It is covered in a cursory manner in the chapters on food and water safety. • The document appears inconsistent in describing two problems: 1) under-reporting of disease, and, 2) disease surveillance capacity. Under-reporting of Lyme/vector borne disease is not covered 					<p>1. Comprehensive Approach: The approach and organization of each chapter was decided after conducting a comprehensive literature review based on scope, both of each chapter and of the report. Two case studies, Lyme disease and West Nile virus, were chosen as representative examples of vectorborne disease in the US for this chapter due to their incidence and the body of literature available. This chapter uses these two case studies to examine observed and projected impacts of climate change on human health.</p> <p>2. Vulnerability/prevention: The text has been modified in the Populations of Concern section, as the authors feel this is the most appropriate place for a brief discussion of prevention activities that may reduce vulnerability to VBD. A detailed discussion of VBD prevention goes beyond the scope of the chapter.</p> <p>3. Reporting and surveillance: A discussion of the caveats of Lyme disease surveillance goes beyond the scope of the chapter. The underreporting of Lyme disease is not central to this discussion and due to page limit restrictions for our chapter and for the report we must limit our discussion of surveillance to remain within the scope of the report. Of note: the goal of Lyme disease surveillance is not to capture every case, but to systematically gather and analyze public health data in a way that enables public health officials to look for trends and take actions to control or prevent the disease and, thus, improve public health.</p> <p>4. Humidity and tick population: While the comment suggests a good specific example, the authors feel the existing examples are appropriate and adequate under the section header “Geographic distribution of ticks,”</p>

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		<p>adequately. The discussion of the under-reporting of heat illness could be used as a model for other chapters.</p> <p>Specific comments below are also provided in the comment sections for individual chapters:</p> <p>Page 2, Line 28. This list of vulnerable populations is fairly comprehensive, but neglected to include social isolation. In addition, while it is important to list the factors that make people vulnerable, isn't it equally important to list the factors that protect these vulnerable populations from climate effects?</p> <p>Page 8, Figure ES3. The colors used for changes in ozone concentrations are confusing. For the other maps, blue is used to show areas of decrease, with the greatest decreases showing the darker shades of blue. For ozone, light blue is used to denote an increase in concentrations, but the color choice misleads the reader to thinking these are areas of decreasing levels.</p> <p>Page 51, Key finding #4. Several factors are linked to risk of heat health impacts: age, race, social status and disease/disability. Environment is not mentioned. Isn't where/how people live an important risk factor worth mentioning? If data on the health impacts of living in a heat island are lacking, shouldn't this be included in the section on Research Needs?</p> <p>Page 53, line 31. There is a lack of candor in this description on the problems with assigning temperature as a cause or contributor to death such as the level of examination into the cause of death in an 80+ year old individual. It is quite possible that those most vulnerable to dying from the heat may be the least likely to be identified as such.</p> <p>Page 63, line 7. Start a new paragraph. A person's environment is an important concept and does not belong in a paragraph that begins with risks associated with pregnancy.</p> <p>Page 84, Figure 3. The individual heat and cold maps provide</p>					<p>which focuses on the vector's distribution, rather than enzootic transmission of the pathogen.</p> <p>In regards to comments on the Water-Related Illness chapter, we have added a paragraph under drinking water to include these suggestions. The mortality statistic for the Milwaukee Cryptosporidium outbreak has been revised for consistency and accuracy with the underlying literature.</p> <p>In regards to comments on the Food Safety, Nutrition, and Distribution chapter, the author team has deliberated and agreed that there is a clear health link regarding drought and water quality and that information is so stated in this chapter's section on extreme weather. Drought is also further discussed in Chapters on Temperature-Related Death and Illness and Extreme Events. We appreciate this suggestion, but space is limited and discussion of adaptive responses is beyond the scope of the report.</p> <p>In regards to comments on Extreme Events chapter, the author team has deliberated and agreed that there is a clear health link regarding drought and water quality and that information is so stated in this chapter's section on extreme weather. The chapter on Extreme Events includes information regarding health impacts to emergency workers/first responders, as well as potential health risks associated with the cleanup phase following an extreme event. Due to the size of the topic, and the page limit for the chapter, we focused on broad trends rather than delving too deeply or providing such a level of specificity. No change has been made to the text.</p>

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		<p>detailed information about the location and severity of the impact of temperature. This is an excellent presentation of data, but is somewhat difficult to read. Could a fourth map be included that combines the data sets and presents a single color for each state or region based on the municipalities within its borders? The casual reader could get a general idea of future trends, those wanting specific data could get it from the maps depicting individual municipalities.</p> <p>Page 97. The document states that the majority of PM and ozone exposures result from indoor exposures due to the relatively large percentage of time spent indoors. However, for acute respiratory hazards like ozone, those higher outdoor exposures may be much more hazardous. Spending 10 hours exposed to 10 ppb ozone indoors is not equivalent to spending 1 hour exposed to 100 ppb outdoors. My guess is that in areas where outdoor levels frequently exceed NAAQS standards, indoor air levels rarely, if ever, do.</p> <p>Page 99. As with other chapters, individuals are not identified as being in a population of concern based on their environments. Clearly, those living in areas heavily impacted by emissions are vulnerable to increases.</p> <p>Page 121. This chapter lacks the comprehensive approach of the chapter on heat illness. Section 4.5 describes population of concern, and describes some of the factors that increase exposure to Lyme and the frequency of illness, but does not use the term vulnerable. In contrast, Chapter 2 used the term vulnerable at least a dozen times. Using different terms to describe the same concept is confusing. The significant difference between the populations most at risk for WNV vs. Lyme argue for very different strategies for targeted prevention activities, regardless of the fact that the vectors are different. Discussions of vulnerability to disease would benefit from a discussion of factors which are protective of disease. Since disease rates will be influenced by the effectiveness of prevention, shouldn't this be included in the document? One way to address this issue would be to include a more thorough discussion of the effectiveness of prevention activities under the section on Research Needs.</p>					<p>In regards to comments on Populations of Concern chapter, this chapter address cross-cutting issues common to all of the health topic chapters in the report (chapters 2-8), which is why the vulnerability mapping discussion appears only in this chapter and not elsewhere in the report. After consideration of this point, we still feel the original approach and structure is appropriate given the report's space limitations.</p> <p>With regard to the comment on implementing protective factors, we note that adaptation or mitigation strategies are beyond the scope of this report. Consideration of human adaptive capacity has been included as appropriate to assess projected climate impacts on human health.</p>

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		<p>Page 124. In contrast to the chapter on heat that gives clear indication that reported cases of heat illness greatly underestimate actual cases, there is no mention of this fact for vector borne disease. Lyme is greatly under-reported.</p> <p>Page 129, line 22. Periods of low humidity can cause crashes in tick populations significant enough to decrease disease transmission rates.</p> <p>Page 161, Chapter 5. This chapter fails to mention the relationship between climate change and severe droughts. The lack of potable drinking water has increased the use of treated wastewater as a drinking water source. While we might not have detailed information about the health risks presented by this practice, it must be acknowledged that climate related drought is changing the safety of our source water. Climate change is impacting source water protection, an important concept worth mentioning.</p> <p>Page 168. A different mortality statistic was quoted in the Chapter 7 for the Milwaukee outbreak.</p> <p>Page 219, line 24. In areas where there is not enough water, a problem exacerbated by drought, drinking water supplies must compete with agriculture for potable water. While, as the document states, the health implications are unclear, the issue could be developed in more detail. It would be useful to simply state the questions that drought prone areas are going to need to address in order to both maintain safe drinking water supplies and maintain agriculture.</p> <p>Page 250, Chapter 7. Just as Chapter 9 covers the issue of mental health impacts of climate change on emergency response workers, it would be helpful for this chapter to cover the increased injury rates among workers after extreme weather events such as untrained employees use chain saws and other equipment to bring businesses back on line.</p> <p>Page 335, Chapter 9, Key Finding 4: The use of geographic data allows for more sophisticated mapping of risk factors and social vulnerabilities to identify and protect specific locations and groups</p>					

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		of people. An appreciation for this finding does not appear throughout the document.					
Justin	G.	It would be very helpful to indicate benefits, if any, of climate change at this point given that negatives were just introduced. If there are no benefits, I'd state that outright at this location.	Executive Summary		2	27	The assessment does consider both benefits and harms to human health associated with climate change, as represented by the underlying literature supporting evidence of these impacts. This process is described in the Front Matter. The report has been reviewed to consider where clarification was needed on this subject.
Robert	Vanderslice	<p>USGCRP The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment.</p> <p>Chapter 2</p> <p>Page 51, Key finding #4. Several factors are linked to risk of heat health impacts: age, race, social status and disease/disability. Environment is not mentioned. Isn't where/how people live an important risk factor worth mentioning? If data on the health impacts of living in a heat island are lacking, shouldn't this be included in the section on Research Needs?</p> <p>Page 53, line 31. There is a lack of candor in this description on the problems with assigning temperature as a cause or contributor to death such as the level of examination into the cause of death in an 80+ year old individual. It is quite possible that those most vulnerable to dying from the heat may be the least likely to be identified as such.</p> <p>Page 63, line 7. Start a new paragraph. A person's environment is an important concept and does not belong in a paragraph that begins with risks associated with pregnancy.</p> <p>Page 84, Figure 3. The individual heat and cold maps provide detailed information about the location and severity of the impact of temperature. This is an excellent presentation of data, but is somewhat difficult to read. Could a fourth map be included that combines the data sets and presents a single color for each state or region based on the municipalities within its borders? The casual reader could get a general idea of future trends, those wanting</p>	Ch 2: Temperature-Related Impacts				<p>Point 1: Environmental issues are discussed in the text. No change made.</p> <p>Point 2: The issue of difficulty of assigning diagnosis codes is discussed in the text already. No change made.</p> <p>Point three: The text has been edited to make pregnancy its own paragraph.</p> <p>Point 4: changes have been made to try and address the issues identified with this Figure.</p>

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		specific data could get it from the maps depicting individual municipalities.					
Robert	Vanderslice	<p>USGCRP The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment.</p> <p>Chapter 3</p> <p>Page 97. The document states that the majority of PM and ozone exposures result from indoor exposures due to the relatively large percentage of time spent indoors. However, for acute respiratory hazards like ozone, those higher outdoor exposures may be much more hazardous. Spending 10 hours exposed to 10 ppb ozone indoors is not equivalent to spending 1 hour exposed to 100 ppb outdoors. My guess is that in areas where outdoor levels frequently exceed NAAQS standards, indoor air levels rarely, if ever, do.</p> <p>Page 99. As with other chapters, individuals are not identified as being in a population of concern based on their environments. Clearly, those living in areas heavily impacted by emissions are vulnerable to increases.</p>	Ch 3: Air Quality				The section has been revised to more clearly reflect that exposure to higher ozone levels usually occurs outdoors. Space limitations preclude a more extensive discussion.
Robert	Vanderslice	<p>USGCRP The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment.</p> <p>Chapter 4</p> <p>Page 121. This chapter lacks the comprehensive approach of the chapter on heat illness. Section 4.5 describes population of concern, and describes some of the factors that increase exposure to Lyme and the frequency of illness, but does not use the term vulnerable. In contrast, Chapter 2 used the term vulnerable at least a dozen times. Using different terms to describe the same concept is confusing. The significant difference between the populations most at risk for WNV vs. Lyme argue for very different strategies for targeted prevention activities, regardless of the fact that the vectors are different. Discussions of vulnerability to disease would benefit from a discussion of factors which are protective of disease. Since disease rates will be influenced by the effectiveness of prevention, shouldn't this be included in the document? One way to address this issue would be to include a more thorough discussion of the effectiveness of prevention activities under the</p>	Ch 4: Vectorborne Diseases				<p>We greatly appreciate your feedback. Responses to this comment pertaining to Vectorborne Disease chapter have been broken into sections:</p> <p>1. Comprehensive Approach: The approach and organization of each chapter was decided after conducting a comprehensive literature review based on scope, both of each chapter and of the report. Two case studies, Lyme disease and West Nile virus, were chosen as representative examples of vectorborne diseases in the US for this chapter due to their incidence and the body of literature available. This chapter uses these two case studies to examine observed and projected impacts of climate change on human health.</p>

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		<p>section on Research Needs.</p> <p>Page 124. In contrast to the chapter on heat that gives clear indication that reported cases of heat illness greatly underestimate actual cases, there is no mention of this fact for vector borne disease. Lyme is greatly under-reported.</p> <p>Page 129, line 22. Periods of low humidity can cause crashes in tick populations significant enough to decrease disease transmission rates.</p>					<p>2. Vulnerability/prevention: The text has been modified in the Populations of Concern section, as the authors feel this is the most appropriate place for a brief discussion of prevention activities that may reduce vulnerability to vectorborne diseases. A detailed discussion of VBD prevention goes beyond the scope of the chapter.</p> <p>3. Reporting and surveillance: A discussion of the caveats of Lyme disease surveillance goes beyond the scope of the chapter. The underreporting of Lyme disease is not central to this discussion and due to page limit restrictions for our chapter and for the report we must limit our discussion of surveillance to remain within the scope of the report. Of note: the goal of Lyme disease surveillance is not to capture every case, but to systematically gather and analyze public health data in a way that enables public health officials to look for trends and take actions to control or prevent the disease and, thus, improve public health.</p> <p>4. Humidity and tick population: While the comment suggests a good specific example, the authors feel the existing examples are appropriate and adequate under the section header “Geographic distribution of ticks,” which focuses on the vector’s distribution, rather than enzootic transmission of the pathogen.</p>
Robert	Vanderslice	<p>Chapter 5</p> <p>Page 161, Chapter 5. This chapter fails to mention the relationship between climate change and severe droughts. The lack of potable</p>	Ch 5: Water-Related Illness				The text has been revised to incorporate a brief discussion of the health implications of drought-related impacts to water quality and supply, as well as human response to drought (water reuse and overdrawing aquifers). In addition, the research needs section has been edited to include these issues. Further treatment

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>drinking water has increased the use of treated wastewater as a drinking water source. While we might not have detailed information about the health risks presented by this practice, it must be acknowledged that climate related drought is changing the safety of our source water. Climate change is impacting source water protection, an important concept worth mentioning.</p> <p>Page 168. A different mortality statistic was quoted in the Chapter 7 for the Milwaukee outbreak.</p>					<p>of these topics is provided in the Extreme Events chapter, and a cross-reference to that chapter has been included in this chapter.</p> <p>The mortality statistic for the Milwaukee Cryptosporidium outbreak has been revised for consistency and accuracy with the underlying literature.</p>
Robert	Vanderslice	<p>Chapter 6</p> <p>Page 219, line 24. In areas where there is not enough water, a problem exacerbated by drought, drinking water supplies must compete with agriculture for potable water. While, as the document states, the health implications are unclear, the issue could be developed in more detail. It would be useful to simply state the questions that drought prone areas are going to need to address in order to both maintain safe drinking water supplies and maintain agriculture.</p>	Ch 6: Food Safety				<p>The author team has deliberated and agreed that there is a clear health link regarding drought and water quality and that information is so stated in this chapter's sub-section on the impacts of extreme weather on pathogens. Drought is also further discussed in Chapters on Thermal Extremes and Extreme Events. We appreciate this suggestion, but space is limited and discussion of adaptive responses is beyond the scope of the report.</p>
Robert	Vanderslice	<p>Chapter 7.</p> <p>Just as Chapter 9 covers the issue of mental health impacts of climate change on emergency response workers, it would be helpful for this chapter to cover the increased injury rates among workers after extreme weather events such as untrained employees use chain saws and other equipment to bring businesses back on line.</p>	Ch 7: Extreme Events				<p>We appreciate the suggestion. Due to the size of the topic of extreme events, and the page limit for the chapter, we focused on broad trends rather than delving too deeply into the topic of injuries among emergency response workers. The author team has deliberated and feel that this issue has been adequately and clearly addressed in the chapter.</p>
Robert	Vanderslice	<p>Chapter 9</p> <p>Page 335, Key Finding 4: The use of geographic data allows for more sophisticated mapping of risk factors and social vulnerabilities to identify and protect specific locations and groups of people. An appreciation for this finding does not appear throughout the document.</p>	Ch 7: Extreme Events				<p>This comment is a duplicate of one submitted by another reviewer and has been addressed.</p>
Erica	Brown	<ul style="list-style-type: none"> Under non-climate stressors is listed "ecosystem degradation" which the report points out may be positive or negative. Therefore suggest changing "ecosystem degradation" to "ecosystem change" throughout the document. 					<p>The text has been revised to clarify.</p>

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
Erica	Brown	The document should represent an unbiased assessment of the relationship between climate and health, in such as way so as not to overstate the risk that is described in the reports and underlying data. For example, ES -Page 2-line 1-“Climate change is a significant threat to the health of the American people...” This is stated in a way that better represents the uncertainty described throughout the report in section 1.4.2 (Page 23-line 1): “Climate change threatens human health and well-being in the U.S.” This report does not define what is meant by “significant” and whether that is attributable to climate change, or just your everyday climate events.					After consideration of this point, we still feel the existing text is clear and accurate, and appropriate for the different purposes of the Executive Summary versus the Introduction chapter.
Justin	G.	I'd juxtapose something akin to "that has been published" to the text "new literature" on line 2 given the long lag time between research studies and publication. Scientists may not know the cutoff date for literature for the Third National Climate Assessment, and as such, the "literature" mentioned here may not be new.	Executive Summary		3	2	The text has been revised to incorporate this suggestion.
Erica	Brown	• Each chapter has a paragraph on “traceable accounts”. This term should be explained further throughout the document.					This term is defined in the front matter of the final report.
Erica	Brown	• Overall, while the report covers a broad range of relationships, the only relationships that can be drawn with more than a medium confidence between climate change and public health appears to be increases in risk due to: thermal stress, elevated ozone, and impacts of flooding, extreme weather and other physical stressors-that occur both naturally and randomly, but which may be exacerbated by climate change. Suggest that the report indicate this upfront, in plain language.					The varying levels of supporting evidence, confidence in impacts, and uncertainty in projections are described in The Introduction chapter as well as the Technical Support Document. Specific descriptions of confidence in impacts can be found in each chapter’s Traceable Accounts section.
Justin	G.	recommend adding "Third" next to "National Climate Assessment"	Executive Summary		3	1	The text has been revised to clarify the edition.
Erica	Brown	• The report lacks important information to help the reader assess the strength or weaknesses in the qualitative assessment of the uncertainty and likelihood of each of the key findings. Additionally, some of the assessments seem at odds or seemingly contradict the discussion in the text. For example, Key Finding 1,					Descriptions of the use of likelihood and confidence language are in the Front Matter, the introduction chapter, in detail in the Technical Support Document and Appendix on Likelihood and Confidence, and in every

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		on Page 51 notes that the potential for additional deaths due to heat in summer is “very likely, high confidence”; while the deaths from cold ranked as “very likely, medium confidence”, yet the deaths projected to be smaller due to cold than heat listed as “likely, medium confidence”. Why is this the case? Some of the rationale is explained in the text, but since the net increase is attributable to one study-the rationale for this quantification is unclear. (This is also a comment for Chapter 2)					chapter’s Traceable Accounts. Front matter and an appendix also describes the process for drafting the report. All Key Findings and Traceable Accounts have been reviewed and revised with consideration for inclusion and categorization of likelihood and confidence language, as outlined in The Introduction chapter.
Erica	Brown	The report states that "likelihood" is supposed to range from “unlikely to very likely”. However, on page 123, line 15, the term “extremely likely” is used, calling into question how closely aligned the estimates of likelihood are to the scaling process.					The text has been revised to incorporate this suggestion. Also of note, likelihood levels are described in the Introduction section 1.4.3 “Approach to Quantifying Uncertainty in this Report” and will also be added to every chapter’s traceable accounts section.
Justin	G.	I recommend citing the Third National Climate Assessment here.	Executive Summary		3	22	Please see underlying chapters for citations.
Erica	Brown	<ul style="list-style-type: none"> We suggest that the information that ties infrastructure failure as a result of extreme events and the increase in public health risk be tied primarily to chapter 7, with a reference made to it in Chapter 5. Specifically, in chapter 5 Key finding 3 about aging infrastructure and extreme events should instead be listed in chapter 7. And another finding noted in Chapter 5 should instead be elevated as a key finding, i.e.: “If drinking water is appropriately treated, climate change is not expected to increase the risk of contracting a water-related illness.” This fact is important to point out in the discussion of the Walkerton outbreak because although the rainfall may have been a catalyst (and it’s not clear from the text that the rainfall event would be classified as “extreme”), the other factors included an improperly chlorinated/treated system and criminal neglect as well as the factors listed in the chapter. As noted in the report by CBC news about the judicial inquiry into Walkerton, which has links to the inquiry report (http://www.cbc.ca/news2/background/walkerton/walkerton_report.html), “The most serious case of water contamination in Canadian 					<p>The Water-Related Illness and Extreme Events chapters have not been restructured in this way. Extreme Events text and key findings have been revised to emphasize infrastructure impacts from extreme events and better reflect the literature available for climate change impacts in the US; however, Waterborne Disease chapter also includes discussion of water infrastructure given its central importance to the topic water-related illness.</p> <p>Key Finding #2 is with regard to drinking water sources. After consideration of this point, we still feel the existing text is clear and accurate, and reflects the body of literature available for impacts within the US. Literature to support the efficacy of drinking water treatment practices in the face of climate change are limited and still emerging.</p>

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		history could have been prevented by proper chlorination of drinking water.”					
Erica	Brown	<ul style="list-style-type: none"> • With regard to the infrastructure failure that we recommend be addressed solely in chapter 7, not 5 (with a reference that the reader consult chapter 7), the likely issue with infrastructure failure is that water treatment systems are shut down (and this has different implications to the population depending on if the drinking water or wastewater utility is shut down.) 					The chapters on Water-Related Illness and Extreme Events have not been restructured in this way. However, the chapter on Extreme Events text and key findings have been revised to emphasize infrastructure impacts from extreme events and better reflect the literature available for climate change impacts in the US; however, the chapter on Water-Related Illness also includes discussion of water infrastructure given its central importance to the topic water-related illness.
Justin	G.	regarding the clause "are likely to experience worsening impacts," would this be necessarily true if adaptation actions are taken?	Executive Summary		3	25	The assessment does not include detailed discussions of climate mitigation, adaptation, or economic valuation. Consideration of greenhouse gas emissions pathways and human adaptive capacity (see Front Matter and Introduction chapter) has been included as appropriate to assess projected climate impacts on human health.
Erica	Brown	<ul style="list-style-type: none"> • The danger for the population for a cessation in drinking water treatment is the lack of water – and finding sources or drinking water - and this danger is potentially more so than the risk of waterborne disease from drinking contaminated water from a public water system. While a report by the Water Research Foundation following Hurricane Irene (http://www.waterrf.org/resources/Lists/PublicSpecialReports/Attachments/6/Hurricane_Irene_Survey_Report.pdf) does indicate that a few systems did experience contamination of the distribution system, this number is lower than those who experienced source water contamination and an order of magnitude lower than those who experienced a loss of power. Again, the potential for the treatment plant to be shut down and implications for the availability of water for drinking appears to be the greater risk. 					Chapter 5 currently emphasizes source water contamination related to extreme precipitation. Chapter 7 text and key findings have been revised as suggested to emphasize infrastructure impacts/failure from extreme events such as hurricanes and better reflect the literature available for climate change impacts in the US. The text in Chapter 5 has been revised to mention treatment plant shut down and water availability.
Justin	G.	The figure may be hard to relate to the caption for those with black and white printers.	Executive Summary	1	4		Figure has been revised and meets USGCRP standards.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
Justin	G.	The figure may be hard to relate to the caption for those with black and white printers.	Executive Summary	1	4		Figure has been revised and meets USGCRP standards.
Erica	Brown	The ES would be improved if there was a clear up front summary statement that delineates between: a. Where the report makes clear statements and can quantify the potential direction, likelihood and certainty of a relationship between climate change and public health, and b. Where there is uncertainty about direction, likelihood, and certainty of a relationship.	Executive Summary				Descriptions of the use of likelihood and confidence language are in the Front Matter, the introduction chapter, in detail in the Technical Support Document and Appendix on Likelihood and Confidence, and in every chapter's Traceable Accounts. Front matter and an appendix also describes the process for drafting the report.
Erica	Brown	The ES would be improved if there was a clear up front summary statement that delineates between: a. Where the report makes clear statements and can quantify the potential direction, likelihood and certainty of a relationship between climate change and public health, and b. Where there is uncertainty about direction, likelihood, and certainty of a relationship.	Executive Summary				Descriptions of the use of likelihood and confidence language are in the Front Matter, the introduction chapter, in detail in the Technical Support Document and Appendix on Likelihood and Confidence, and in every chapter's Traceable Accounts. Front matter and an appendix also describes the process for drafting the report.
Erica	Brown	It appears that the only relationships that can be discussed with any certainty are the relationships between temperature and morbidity/mortality, and temperature and ozone, and physical threats (flooding, drought), yet some of the ways this is quantified gets muddled between chapters.	Executive Summary				The varying levels of supporting evidence, confidence in impacts, and uncertainty in projections are described in the Front Matter, the introduction chapter and the Technical Support Document. Specific descriptions of confidence in impacts and the evidence supporting those relationships can be found in each chapter's Traceable Accounts section.
Erica	Brown	Under non-climate stressors-is listed "ecosystem degradation" which the report points out may be positive or negative. Therefore suggest changing "ecosystem degradation" to "ecosystem change".	Executive Summary				The text has been revised to clarify. These figures have been revised in the executive summary and in each chapter.
Justin	G.	Within the image itself, I recommend changing "geography" to "location" given that those terms are not interchangeable (i.e. "geography" is an entire field which partially consists of other items in the "non-climate stressors" category).	Executive Summary	1	4		This figure has been revised and the titles of the boxes have been edited for clarity. The authors have not changed "geography" to "location", as this is a conceptual diagram and overlap between terms is acceptable. The clarification of these boxes is further described in the Front Matter.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
Erica	Brown	Key Finding 1 states that future climate change could lead to thousands to tens of thousands of deaths each year. This is properly nuanced in the ES in stating that the number is due to deaths due to extreme heat and recognizes that there are also projected to be a decrease in deaths from the cold in the winter-though with less confidence than the projections for heat related death. This statement is in contrast to the results presented on page 61 lines 14-18, which are from one study that projects a net increase of 2000-10000 deaths.	Executive Summary		5	15	The text has been changed in the Executive Summary to match the findings of the chapter on Heat-Related Death and Illness. Please see the traceable account associated with each key finding within the underlying chapter for more information on the evidence supporting the findings. After consideration of this point, the authors have determined that the existing text is clear and accurate. The research highlights in this assessment are presenting single-study results by design, but are appropriately caveated. No change has been made to the text.
Erica	Brown	Should the items listed as "drivers" be called "impacts" instead? Also, this figure makes no mention of ocean and lake water acidification-an outcome/impact of increasing CO2 levels. This impact should be addressed in the document if there are references that tie ocean acidification to public health impacts.	Executive Summary	ES-1	4		This figure has been revised. The figure provides an overview of the finding of all the chapters and is therefore not specific. See chapters on Food Safety and Water Related Illness for information on health impacts of ocean acidification.
Justin	G.	Sorry, I don't see how Figure ES2 links to extreme events despite what the text on the aforementioned lines say.	Executive Summary		5	2	Please see the chapter on Extreme Temperatures for more details and the methodology behind this figure, which shows warming summer and winter months.
Tom	Candino	I very much appreciated the level of detail put into this chapter on air quality and how global climate change will affect human health through the changing atmosphere. I was not aware of the specifics on Ozone, nor was I aware of the particulate matter issue. The content provided on aeroallergens and the increases in allergic stimulants was particularly well done in my opinion as someone who suffers nearly year-round from allergies. I also appreciated how environmental injustice and inequality was touched on to give a well rounded perspective on how individuals and communities are affected, specifically minority communities. The one section I believe could be enhanced with more information was that of indoor air quality. Formaldehyde was mentioned in passing twice, and I believe, based on research and pertinent education I have recently had access to, that the issue of formaldehyde in homes is a huge problem as new homes are	Ch 3: Air Quality				We appreciate this suggestion, but space is limited. The author team has deliberated and agreed on the most important information and illustrations to include.

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		<p>constructed or low-income homes are provided.</p> <p>Post-Katrina, FEMA provided refugees with particularly poorly made trailers for homes, and the overwhelming majority of families responded negatively to unsafe levels of formaldehyde. All over the country, people exposed to high levels of formaldehyde are at risk of various health issues. In the short term, it can cause nose and throat irritation, coughing, headaches, dizziness, and nausea. In the long term, it is believed to be linked to higher cancer rates. And this problem has become abundant not just in trailer communities but in many new homes. It is of course experienced more commonly by minorities or low income families, but the rich are surely not immune to the negative effects of highly-treated wood in their homes.</p> <p>The issue of formaldehyde in homes connects directly to climate change as well, as the chemical is more commonly released in hotter, wetter climates. As the temperature rises worldwide and weather patters produce wetter climates, more people will be exposed to higher levels of formaldehyde and be unsafe or uncomfortable in their own homes.</p> <p>I am not aware of the overall atmospheric effects of high levels of formaldehyde being released into the air, or if there are other issues besides direct human health associated with the high levels in the air, but as this issue becomes more common and research into formaldehyde is increased, it is possible that more evidence will be provided to show that this is a dangerous chemical for consumption and that the production practices of the wood used in homes must be altered.</p> <p>One final note on the issue of indoor air quality not relating to formaldehyde. Might higher temperatures and elevated humidity lead to other chemicals released from other inputs of a home? Is wet, hot paint a concern? Are the finishes used on things like hardwood floors susceptible to chemical releases? These are all questions that come to mind when it comes to indoor air quality. Much information in this chapter was provided on outside air getting in, but what does climate change mean for inside chemicals getting out?</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
Erica	Brown	It is unclear why some items are quantified with both a “confidence” level and a “likelihood” and others are not. This should be explained.	Executive Summary				Descriptions of the use of likelihood and confidence language are in the Front Matter, the introduction chapter, in detail in the Technical Support Document and Appendix on Likelihood and Confidence, and in every chapter’s Traceable Accounts. Front matter and an appendix also describes the process for drafting the report
Justin	G.	Is this specific to the US or worldwide?	Executive Summary		5	16	As noted in the title, preface, in the front matter, the assessment is focused on impacts in the United States. No change has been made to the Executive Summary, which also states that the report focuses on impacts in the United States.
Erica	Brown	According to Chapter 1, which describes the approach for quantifying uncertainty, likelihood is supposed to range from “very unlikely to very likely”. However, on page 9 of the ES the phrase “extremely likely” is used.	Executive Summary		9		Text has been revised to clarify.
Erica	Brown	While the approach used to quantify uncertainty in the report is discussed briefly on pages 37-38, the methodology should be briefly discussed in the Exec. Summary to clarify that the descriptors represent the consensus “expert judgment”.	Executive Summary				Descriptions of the use of likelihood and confidence language are in the Front Matter, the introduction chapter, in detail in the Technical Support Document and Appendix on Likelihood and Confidence, and in every chapter’s Traceable Accounts. Front matter and an appendix also describes the process for drafting the report
Justin	G.	"thousands to tens of thousands" includes a broad range. Understanding that findings need to be very high level, is there a way to rephrase to provide more certainty to this finding? As it reads now, line 16 reads so broadly that it risks being meaningless.	Executive Summary		5	16	After consideration of this point, the authors have determined that the existing text is clear and accurate. The authors feel that this range appropriately characterizes the literature, given the uncertainties involved both in the magnitude of future temperature change and the relationship between that change and mortality. No change has been made to the text.
Justin	G.	What is "normal?" What is the baseline? Does this include a time period governed by nonstationarity in climate (see Milly's 2008 work in the journal Science called "Stationarity is dead").	Executive Summary		5	23	Changes have been made to the text to clarify this.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
Erica	Brown	The text suggests that Table 1 shows health conditions that are associated with increased risk from climate change related exposures. For this table, the statement could be interpreted to mean that such health conditions as Alzheimer's disease increase from climate change exposures. This table and the associated table caption should be edited to indicate that it is a table of health conditions and those populations with these conditions are at increased vulnerability to adverse effects associated with climate change.	Ch 1: Preface and Introduction		31	8	The text has been revised to clarify.
Erica	Brown	The text suggests that Table 1 shows health conditions that are associated with increased risk from climate change related exposures. For this table, the statement could be interpreted to mean that such health conditions as Alzheimer's disease increase from climate change exposures. This table and the associated table caption should be edited to indicate that it is a table of health conditions and those populations with these conditions are at increased vulnerability to adverse effects associated with climate change.	Ch 1: Preface and Introduction	1	31		The figures, tables, and captions have been revised.
Justin	G.	I believe the deviations are also functions of geography.	Executive Summary		5	24	No changes have been made to the text.
Erica	Brown	The uncertainty and likelihood estimates for each key finding are based on expert judgment of the lead authors for the chapters. That should also be clearly stated in the ES along with (in appendix) some information on the judges and their expertise. While the approach used to quantify uncertainty in the report is discussed briefly on pages 37-38, the methodology should be briefly discussed in the Exec. Summary to clarify this for the reader.	Ch 1: Preface and Introduction		36	24	Descriptions of the use of likelihood and confidence language are in the Front Matter, the introduction chapter, in detail in the Technical Support Document and Appendix on Likelihood and Confidence, and in every chapter's Traceable Accounts. The text on uncertainty and likelihood language has been revised to clarify. Front matter and an appendix also describes the process for drafting the report.
Justin	G.	Please clarify whether the years mentioned on the x-axis refer to the years per se or to ranges of years which scientists just refer to as years (e.g. "2050" is often 2045-2055). This can be accomplished easily in the caption.	Executive Summary	ES2	6		The text in the executive summary is amended from the findings of the underlying chapter. The caption for Figure 4 in the Temperature-Related Death and Illness chapter has been revised and this is carried forward into ES Figure 2.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
Erica	Brown	According to Chapter 1, which describes the approach for quantifying uncertainty, likelihood is supposed to range from “very unlikely to very likely”. However, on page 123, line 15, the term “extremely likely” is used.	Ch 4: Vectorborne Diseases		123	15	The text has been revised to incorporate this suggestion. Also of note, likelihood levels are described in the Introduction section 1.4.3 “Approach to Quantifying Uncertainty in this Report” and will also be added to every chapter’s traceable accounts section.
Justin	G.	A statement of the baseline period to provide meaning to "change in deaths" would be very helpful here as the text of the Schwartz et al. (2014) study mentioned in the caption is not available for researching this.	Executive Summary	ES2	6		The text in the executive summary is amended from the findings of the underlying chapter. The caption for Figure 4 in the Temperature-Related Death and Illness chapter has been revised and this is carried forward into ES Figure 2.
Erica	Brown	The Chapter title in Table of Contents is Water-Related Illness (and in the header for Chapter 5); however the subheading is about “waterborne illness”. And some of the discussion, arguably, is about really about food borne illness from ingesting aquatic organisms (e.g. Ciguatera). And key finding 3 is about water infrastructure failure. This mixture of topics, issues, and nomenclature, makes it difficult to follow the relationship between climate and public health since these are distinct concerns. Given the disparate topics covered in this Chapter, we suggest using the term "water-related illness" throughout as a more apt description.	Ch 5: Water-Related Illness				The text has been revised to more consistently reflect the title of the chapter, “water-related illness.”
Erica	Brown	The water infrastructure and public health section also covers a range of potential sources and exposure pathways including water, wastewater, and stormwater concerns. We strongly recommend that the authors rewrite chapter 5 so as to separate the public health impacts due to contact with recreational water, stormwater runoff or standing water from those impacts that are due to the exposure to contaminated drinking water.	Ch 5: Water-Related Illness				The text has been revised to clarify the existing distinction between the drinking water and recreational water sections of the chapter. The purpose of the Key Findings is to provide summary conclusions based on the weight of the literature; therefore, no changes have been made to create separate Key Findings for drinking water vs. recreational water.
Justin	G.	I suggest rephrasing the y-axis title to "Change in Number of Deaths" as that's technically more accurate than what's written there.	Executive Summary	ES2	6		The author team believes that, with the revised caption, no change is needed to the y-axis label.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
Erica	Brown	Overall, the Chapter would be improved by moving the discussion of extreme events and impacts on water infrastructure to Chapter 7. In addition, the secondary affects of climate change on infrastructure failure should also be discussed in Chapter 7, extreme events. In addition, this discussion should make a distinction between the secondary effects to drinking water, wastewater or storm water infrastructure because the impacts to the public health risk will differ.	Ch 5: Water-Related Illness				<p>Water-Related Illness and the Extreme Events chapters have not been restructured in the way recommended by the commenter.</p> <p>Text and key findings in the Extreme Events chapter have been revised to emphasize infrastructure impacts from extreme events and better reflect the literature available for climate change impacts in the US; however, the authors have decided to maintain the discussion of water infrastructure in this chapter given its central importance to the topic water-related illness. The text has been revised to clarify relevant differences in exposure risks related to failure of wastewater or storm water infrastructure vs. drinking water infrastructure or treatment barriers.</p> <p>The chapter on Extreme Events does include discussion of infrastructure failure due to extreme events. The chapter text and key findings have been revised to emphasize this topic and better reflect the literature available for climate change impacts in the US.</p>
Erica	Brown	The Chapter should also clearly distinguish and provide an assessment of the certainty and likelihood of climate change impacts on public health due to the following: direct exposure to pathogens in drinking water; direct exposures from pathogens due to direct contact with surface water for recreational purposes, and due to ingestion of freshwater/marine aquatic organisms (e.g. Ciguatera, brevetoxins, etc.).	Ch 5: Water-Related Illness				In accordance with guidelines on assigning confidence and likelihood, the authors did not assign likelihood language to Key Finding regarding drinking water and recreational water exposure as there are no quantitative estimates of likelihood in the published, peer-reviewed literature on which to base such conclusions.
Erica	Brown	We recommend that this chapter separate the discussion of drinking water served by public water systems from that with private, untreated groundwater wells. In addition, we recommend that the authors describe in more detail the relationship between climate change and ground water quality.	Ch 5: Water-Related Illness				We have revised the text to draw a clearer distinction between treated and untreated drinking water in section 5.4.1. Public treated water systems and untreated groundwater supplies are addressed in two separate paragraphs but we chose not to use separate subheadings due to page limitations for the chapter. We have provided more detail where

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
							supported by the literature regarding the relationship between climate change and groundwater quality.
Justin	G.	Please clarify the status of the Schwartz et al. (2014) article mentioned here, as basing a seminal figure on an article which just has the status "submitted" (per bibliography) can be problematic. If it has already undergone peer review though, this is a non-issue.	Executive Summary	ES2	6		The final citation is provided in the final report, in accordance with IQA requirements.
Erica	Brown	Key finding 2 - We recommend separating drinking water from recreational water issues, as these are distinct concerns that are sometimes confused by the study authors.	Ch 5: Water-Related Illness		163	9	The text of the key finding has been revised for clarity.
Justin	G.	Given the residence time of carbon in the atmosphere, will offsetting reductions help in the near term? I suggest qualifying the sentence accordingly, or rephrasing to include why the residence time of carbon in the atmosphere would be a non-issue for this statement.	Executive Summary		7	14	All Key Findings have been reviewed and revised.
Erica	Brown	According to the text, 90% of the U.S. is served by a public water system (which has to meet all SDWA quality and disinfection requirements), and as noted on p. 169, lines 23-25, "if drinking water is appropriately treated, climate change is not expected to increase the risk of contracting a water-related illness". This quote should be called out as a key finding and brought up front to the ES. Specifically, we recommend that this statement become Key finding 3 and the current Key finding about infrastructure be moved to Chapter 7 on Extreme events.	Ch 5: Water-Related Illness		163	17	The Key findings have been revised and the Executive Summary has been revised to reflect these changes in the underlying chapter. The Executive Summary is designed to provide a high level overview of key findings across the report, so the authors felt it was appropriate to leave these details in the underlying chapter on water-related illnesses. Please see the chapters on Water-Related Illness and Extreme Events for more information. Information related to public water systems and observed projections in runoff has also been added to the Introduction chapter. However, the change the commenter suggested, to move the infrastructure key finding to the chapter on Extreme Events, has not been done, as the authors feel this is an important topic to cover in the water-related illnesses chapter. While Key Finding 3 does address the impact of extreme precipitation events, the impacts are specifically related to the increased risk of water-related pathogens,

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
							chemicals and algal toxins. The Extreme Events chapter does include discussion of flooding and infrastructure, but provides fewer details on the health impacts of water-related contaminants due to overflow or runoff or flooding events than does the chapter on water related illnesses. The authors decided it should remain in the Water-Related Illness chapter and have revised the text for clarity and to better reflect the supporting literature.
Erica	Brown	This table includes a number of pathogens where the waterborne exposure route is listed as “Drinking Water (esp. untreated)”. As the authors point out on page 169, if drinking water is appropriately treated, climate change is not expected to substantially increase the risk of contracting a water-related illness. Suggest that these sections of Table 1 be modified so that the exposure route is listed as “untreated drinking and surface waters” rather than Drinking Water (esp. untreated). The text should also recognize the efforts of the water sector under the SDWA and CWA to build additional barriers and treatment systems and to build more resilient water and wastewater systems to reduce these exposure pathway risks.	Ch 5: Water-Related Illness	1	164		The column heading has been revised after consideration of this comment and other comments on Table 1. Regarding efforts under the SDWA and CWA, discussion of human adaptive capacity has been included as appropriate to assess projected climate impacts on human health.
Justin	G.	Regarding "rising temperatures" and "increasing precipitation," the Third National Climate Assessment mentioned that the portions of the Southeastern US may experience a slight cooling effect and that the Southwest and Western portions of the US will experience prolonged drought. I therefore suggest rephrasing this sentence.	Executive Summary		7	19	After consideration of this point, we still feel the existing text is clear and accurate, and consistent with the findings of the NCA3.
Justin	G.	This figure is difficult to read in black and white (i.e. not everyone has a color printer).	Executive Summary	ES3	8		The figure has been revised.
Erica	Brown	The text notes, “Drinking water can be both treated and untreated”. We recommend that the next sentence clarify that public drinking water systems (PWS) provide TREATED potable water to 90% of Americans. In addition, this section should point out up front that PWS will respond to climate change induced threats to water quality (such as increased turbidity due to storms) by treating the water to comply with the SDWA, even at greater cost. This is not clear, as the text often mixes the two kinds of systems (i.e., PWS and untreated, private ground water wells).	Ch 5: Water-Related Illness		168	4	The draft chapter already acknowledged the role of drinking water treatment in maintaining water quality, but the text has been revised to further clarify the distinction between treated and untreated systems. The text has also been revised to clarify the role of climate change in contributing to potential future breakdowns in drinking water treatment systems.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
Erica	Brown	Key Finding 3 suggests that damage to or a breakdown in water infrastructure “could contribute to increased risk of exposure to water related pathogens, chemicals and algal toxins. This finding should be edited to clarify that the concern here is not with treated drinking water, but with direct contact with flood waters that are contaminated, and potentially, the lack of access to treated water (say if the roads, power, and other utilities are cut off. The other concern would be lack of water, because the water utility is not capable of delivering treated water due to infrastructure failure. Some of the examples cited are process system issues and failure to provide an extra disinfection barrier to address protozoan risks (a problem since corrected under the LT2ESWTR and the GWR, respectively. All public water supplies meet all SDWA requirements for quality and disinfection even after infrastructure is damaged (per item above). If the plant is damaged or vulnerable the risk is instead that the water plant will shut down for a period of time, as occurred following several hurricanes and flooding events, and it will be the lack of potable drinking water (and public fire protection) or more costly water that will be the stressor associated with infrastructure damage. This key finding should be clarified and moved to Chapter 7.	Ch 5: Water-Related Illness		183	22	While Key Finding 3 does address the impact of extreme precipitation events, the impacts are specifically related to the increased risk of water-related pathogens, chemicals and algal toxins. The authors decided it should remain in this chapter and have revised the text for clarity and to better reflect the supporting literature. No change has been made in direct response to this comment.
Justin	G.	Earlier in the chapter, the mortality rate from climate change was estimated as "thousands to tens of thousands." I don't think that's consistent with the numbers provided here, despite the fact that the text includes both illnesses and deaths; perhaps I missed it in the source listed here. I suggest sticking with one value.	Executive Summary		8	8	This figure is depicting ozone impacts as described in the chapter on Air Quality Impacts, while the text the commenter refers to is from the key finding in the chapter on Extreme Temperatures.
Erica	Brown	Key Finding 3 - The text also discusses that breakdowns in water treatment systems, compounded by aging infrastructure, could lead to more serious consequences that we experience now. That statement is true, whether or not there is climate change. For a PWS, the most serious consequence of infrastructure failure is not so much a breakdown of the system, but the lack of treated drinking water, when the water treatment plant has to shut down because it cannot deliver potable water of sufficiently high quality. Given significant treatment or source water issues attributable to excessive flooding (turbidity) or an inability to meet SDWA requirements, the risk to people and vulnerable populations is that the water system will have to shut down the treatment plant altogether and people will have to find an alternative supply and at higher cost and as a result of this reduced reliability will also lose	Ch 5: Water-Related Illness		183	22	The chapter text has been revised to include mention of need for alternative drinking water supplies if treatment plants shut down.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		public fire protection. – This occurred in several locations during Hurricanes Irene and Lee.					
Justin	G.	I would argue that "geography" is actually a climate factor.	Executive Summary		9	33	After consideration of this point, we still feel the existing text is clear and accurate. The titles of these boxes have been revised and information on how to read these diagrams have been added to the Front Matter.
Erica	Brown	“The assessment of confidence and likelihood based on evidence” should be modified to distinguish drinking water from recreational waters. It is probably correct to state that the confidence is high that increasing frequency or intensity of extreme precipitation will compromise recreational waters and drinking water sources with pathogens, etc. However, as noted on page 169, if drinking water is appropriately treated, climate change is not expected to increase the risk of a water related illness. And generally, it should be noted that if not appropriately treated, the utility will have to notify the public, and shut down or issue a boil water advisory to ensure public health protection. Given this information and the limited number of studies noted, we recommend that the authors reassess the level of certainty or confidence in climate change affecting human exposure risk to water related illness from treated, potable water than suggested by the text on this page.	Ch 5: Water-Related Illness		183	10	The authors reviewed the traceable accounts and key finding and added text to clarify the range of impacts to infrastructure and definitions of failure. We feel we have accurately captured the overall state of the science in our traceable accounts and key findings, though they have been revised for clarity and to better reflect the supporting literature. No change has been made in direct response to this comment.
Justin	G.	Does the model used to generate this figure assume an increase in awareness and reporting due to recognition of modified habitat from climate change? If so, how much of the increase can be attributed to such, rather than climate?	Executive Summary	ES4	10		This is not a modeled projection but a map of reported cases.
Erica	Brown	The discussion is about additional risks due to aging infrastructure and including combined sewers, which were not designed to handle extreme precipitation events. And while the point about CSOs is technically correct, the document should reference the billions of dollars that the large cities are currently investing to make structures more resilient and to plan for and mitigate extreme weather impacts on CSOs.	Ch 5: Water-Related Illness		183	21	The assessment does not include detailed discussions of climate mitigation, adaptation, or economic valuation. Consideration of human adaptive capacity has been included as appropriate to assess projected climate impacts on human health. No change has been made to the text.
Justin	G.	How much of the projected increase results from increased urbanization in the Northeastern seaboard and in the I-94 corridor? i.e. is the map suggesting an increase in the number of lyme disease / amount of people, or just in the number of cases? If it's the latter, it could be argued that simply more people => more reports.	Executive Summary	ES4	10		This is not a modeled projection but a map of reported cases. The text in the executive summary is amended from the findings of the underlying chapter. Please see the chapter on Vectorborne Disease for more details on this figure/ caption.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
Justin	G.	The use of the word "virtually" conflicts with Page 2, Line 18, which states "Every American is vulnerable."	Executive Summary		17	28	The sentence the commenter refers to is a summary of the entire report's findings, while the wording of this key finding is specific to the chapter on mental health and wellbeing, where the specific impact is discussed. The text has been changed in the executive summary to match the findings of the chapter on mental health and well being.
Erica	Brown	The Milwaukee incident was triggered by an extreme precipitation event, and as such it may make sense to include it as an example of a cascading event. However, the authors should be careful not to attribute this specific event to climate change per se, unless there has been research that has put this event in the context of a changing climate. Rather than tie this event to climate change, this incident points out the need to perform the following activities to protect source waters and the water system as a whole from infrastructure failure: o carefully look at water utility operational practices, o conduct vulnerability assessments, o process system safety assessments, and o engage in watershed management activities .	Ch 7: Extreme Events		258	9	The chapter does not attribute the Milwaukee incident to climate change; rather, it is an illustrative example of how cascading impacts can affect health. The chapter discusses general steps to reduce the likelihood of significant adverse impacts from catastrophic cascading failures related to extreme weather events. Detailed coverage of drinking water protection activities is beyond the scope of this report. No change has been made to the text.
Justin	G.	I suggest rephrasing as the sentence concludes awkwardly.	Executive Summary		18	1	All Key Findings have been reviewed and revised for clarity.
Erica	Brown	The Milwaukee incident was triggered by an extreme precipitation event, and as such it may or may not make sense to include it as an example of a cascading event per our previous comment. However, as a result of the Milwaukee Cryptosporidium outbreak, EPA mandated additional barriers and procedures to protect against Cryptosporidium and therefore, many of the citations related to the Milwaukee incident are out of date. These improvements in the SDWA multiple barrier approach should be noted.	Ch 7: Extreme Events		258	9	The chapter discusses the Milwaukee incident as an illustrative example of how cascading impacts can affect health. The chapter discusses general steps to reduce the likelihood of significant adverse impacts from catastrophic cascading failures related to extreme weather events. Detailed coverage of specific SDWA improvements is beyond the scope of this chapter. No change has been made to the text.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
Erica	Brown	The Hoxie et al (1997) reference should be updated with the more recent reference from Davis et al. (2009), which looked at death certificate data and revised the number of deaths attributable to the outbreak down to 69. Specifically, p. 113 of Davis et al notes, “Based mainly on review of death certificate data, we attributed 69 deaths to this outbreak; most of these were premature deaths among people with AIDS/HIV infection (Hoxie et al., 1997).” The citation is: Davis, JP, MacKenzie WR, & Addiss DG (2009). “Lessons from the massive waterborne outbreak of Cryptosporidium infections, Milwaukee, 1993”. In: Global Issues in Water, Sanitation, and Health: Washington DC: National Academies Press, pp. 108-126. Available from: http://www.ncbi.nlm.nih.gov/books/NBK28462/pdf/TOC.pdf . [14 January 2014].	Ch 7: Extreme Events		258	9	We appreciate this suggestion. However, after consideration of additional public comment and scientific review we have decided to omit mention of the Milwaukee Cryptosporidium outbreak from our chapter and refer readers to the chapter on Water-Related Illness for other examples of health impacts when interconnected wastewater, storm water, and drinking water infrastructure fails , such during the Milwaukee Cryptosporidium outbreak.
Justin	G.	Unfortunately, I don't understand why this qualifies as a finding, as this has been done in using GIS since the beginning of the century if not before. Is this use community-specific?	Executive Summary		19	32	The text of this key finding and the underlying chapter section on this topic have been revised. However the authors feel that this is an important point to keep as a key finding. Please see the traceable account for this key finding.
Erica	Brown	The section on drought (Section 7.6) should be organized to include subsections that call out the health implications related to the different aspects of drought. For example, health impacts associated with less access to water, with vector borne disease and air quality concerns. In addition this section does not address affects of drought on sensitive subpopulations. Are there data to suggest that there are impacts to people who are unable to cool off in drought, for example, or is this tied to the extreme heat discussion?	Ch 7: Extreme Events		261	4	We appreciate this suggestion for subsection headers, but space is limited. Regarding drought impacts to sensitive populations, heat effects would be covered in chapter on Thermal Extremes. The amount of literature on other drought-related health impacts on sensitive populations in the U.S. is sparse and still emerging. No change has been made to the text.
Justin	G.	I believe this chapter would benefit from a discussion of the potential for adaptation to alleviate risk, assuming there is potential here. That would be very interesting.	Executive Summary				As noted in the preface, the assessment does not include detailed discussions of climate mitigation, adaptation, or economic valuation, as these are beyond the scope of this assessment. Consideration of greenhouse gas emissions pathways and human adaptive capacity (see Front Matter and introduction chapter) has been included as appropriate to assess projected climate impacts on human health.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
Justin	G.	Unfortunately, I have a hard time understanding why this is a novel finding.	Ch 9: Populations of Concern		337	3	“Ultimately, the author team agreed that the Key Findings included here reflect the state of the science and the existing scientific literature.” This sentence appears in the Traceable Accounts section on page 359.
Erica	Brown	The report lacks important information to help the reader assess the strength or weaknesses in the qualitative assessment of the uncertainty and likelihood of each of the key findings. Additionally, some of the assessments seem at odds or seemingly contradict the discussion in the text. For example, Key Finding 1, on Page 51 notes that the potential for additional deaths due to heat in summer is “very likely, high confidence”; while the deaths from cold ranked as “very likely, medium confidence”, yet the deaths projected to be smaller due to cold than heat listed as “likely, medium confidence”. Why is this the case? Some of the rationale is explained in the text, but since the net increase is attributable to one study-the rationale for this quantification is unclear.	Ch 2: Temperature-Related Impacts				The author team finds that the confidence statements regarding heat deaths, cold deaths, and net deaths are consistent, and grounded in multiple studies. No change has been made to the text.
Justin	G.	Unfortunately, I have a hard time understanding why these are novel findings.	Ch 9: Populations of Concern		337	14	“Ultimately, the author team agreed that the Key Findings included here reflect the state of the science and the existing scientific literature.” This sentence appears in the Traceable Accounts section on page 359.
Justin	G.	Is "likely" meant in a quantitative sense?	Ch 9: Populations of Concern		338	2	The text has been revised to clarify this statement. When used in Key Findings, likelihoods express probabilistic (quantitative) estimates (see Introduction chapter and new Front Matter section).
Justin	G.	Could this sentence be rephrased to "All locations frequented by an individual can contribute to exposure?"	Ch 9: Populations of Concern		339	27	No change made because we feel the existing text is clear and accurate.
Justin	G.	Unfortunately, I have never heard the term "linguistic isolation." Clarification is welcome.	Ch 9: Populations of Concern		341	16	The text has been revised to clarify this topic.
Justin	G.	Please clarify whether the sentence is meant to imply relative to another population(s). I ask because although the word "more" appears, it doesn't mention a comparison.	Ch 9: Populatio		342	5	We have not included an explicit comparison statement here because we feel the existing text

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
			ns of Concern				is clear, accurate, and – importantly given our space limitations – concise.
Erica	Brown	The multiple barrier approach was simply not employed in the case of Walkerton. As a result of this outbreak as well as the one in Milwaukee, several improvements have been made in the SDWA in the U.S. that strengthen the multiple barrier protections that are implied by the statement “if drinking water is appropriately treated.”	Ch 5: Water-Related Illness		168	28	After consideration of this point, we still feel the existing text is clear and accurate. The Walkerton case is being included as an example of how certain drinking water systems may be susceptible to the introduction of agents of water-related illness into their supplies. No change has been made to the text.
Justin	G.	Please clarify whether the sentence is meant to imply relative to another population(s).	Ch 9: Populations of Concern		342	16	We have not included an explicit comparison statement here because we feel the existing text is clear, accurate, and – importantly given our space limitations – concise.
Angela	Dyjack	<p>The American Public Health Association is pleased to submit comments in response to the draft USGCRP report The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment.</p> <p>As the nation’s largest public health organization, representing members from 50 states and all US territories, with a more than 140-year history of commitment to advancing evidence-based approaches to protecting and promoting the health of the American public, APHA is deeply concerned about the current and projected threat to health posed by climate change. Currently, the communities our members serve are experiencing heat waves, extreme weather events, drought, storms and flooding, increased wildfires, increases in vector-, food-, water- and soil-borne disease, increased cardiorespiratory illnesses, mental health impacts, and the myriad health impacts that result from dislocation and job loss.</p> <p>We applaud USGCRP’s decision to conduct this assessment and appreciate the ongoing work to increase Americans’ understanding of the significance of climate change for health. We offer the following comments to help create the strongest final document, and one that will usefully inform the public and decision-makers as</p>					We greatly appreciate your positive comment about our report and hope that you find the content useful. The Front matter describes the methods used to draft the report (e.g. a “Guide to the Report”) and a glossary will be included in the final report. Policy issues are beyond the defined scope of the Climate and Health Assessment, a scientific document that provides the basis for decision making, but does not address policy. The assessment does not include detailed discussions of climate mitigation (or co-benefits of mitigation), adaptation, or economic valuation, nor does it make policy recommendations. Consideration of greenhouse gas emissions pathways and human adaptive capacity (see also Front Matter and Introduction chapter) has been included as appropriate to assess projected climate impacts on human health. The entire report has been reviewed to ensure that populations of concern are consistently described in all the chapters, not just The chapter on Populations of Concern. Text has been added to the Front matter to discuss cumulative impacts, and this topic is now also mentioned in the chapter on Populations of Concern. The transparent

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>well as serve as an effective guide for the work of the public health and health care sectors as they address climate change.</p> <p>The draft assessment effectively enumerates the impacts of climate change on human health in the U.S. It covers a broad range of health topics, and provides well-documented evidence to support conclusions and statements throughout. We are pleased to see that each chapter identifies research needs and includes key findings. In general, the diagrams, figures and tables are well done and are very helpful. We are pleased at the inclusion of Chapter 9, which addresses at-risk populations. It would be helpful to include an explanation at the outset of the methods used to develop this document. A short explanation of format and definitions would also be helpful.</p> <p>However, we feel this draft is not a complete climate and health assessment, but rather the first step toward a complete assessment. We recommend that the scope of the assessment be broadened to address several elements:</p> <ol style="list-style-type: none"> 1. The urgency of climate change mitigation to protect human health. 2. Quantitative assessments of opportunities for health co-benefits from many mitigation and adaptation strategies. 3. A more robust infusion of a lens, that considers social determinants of health as well as the ways in which impacts and vulnerabilities intersect. 4. Assessment of the capacities of local, state and national organizations, agencies, civic bodies and communities to address the health impacts and opportunities of climate change. 					<p>process leading to this report is documented on our website and has included numerous avenues for the public to engage. See new appendix on the process for development of this report.</p>

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>5. Actionable recommendations, including quantitative assessments of costs and benefits, relative to alternative actions or failure to act, in order to provide national guidance to these entities to address these health impacts and opportunities.</p> <p>In addition, we believe this document will be used by some readers who are not familiar with previous reports, such as reports from the Intergovernmental Panel on Climate Change and the National Climate Assessment. Indeed, the NCA was an impressive and careful work, and its chapter on human health includes important, strong statements about climate change and its expected impacts on health. The NCA also provides quantitative data about some of the impacts, which helps scientists, health professionals, decision-makers and the public grasp the magnitude of climate change impacts. We encourage strengthening this report by bringing in more of the same approach. For example, from the NCA:</p> <p>Key Message 1 says “Climate change threatens human health and well-being in many ways...and these health impacts are already underway.”</p> <p>Key Message 2 speaks to existing vulnerabilities and inequities: “Climate change will amplify some of the existing health threats the nation faces today.”</p> <p>Key Message 3 speaks to the need for public health involvement and to the limits of adaptation. It says, “Public health actions, especially preparedness and prevention, can do much to protect people from some of the impacts of climate change. Early action provides the largest health benefits. As threats increase our ability to adapt to future changes may be limited.”</p> <p>“... wildfires result in smoke exposure that has been associated with hundreds of thousands of global deaths annually 260,000 to</p>					

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		<p>600,000 between 1997-2006.” (P. 223 NCA) It also cited a 30- fold increase in fine particle air pollution in Baltimore, MD from a wildfire in Quebec in 2002, roughly a thousand miles away.</p> <p>Elements to Add:</p> <p>1) Mitigation: Both the 2014 NCA and the 2014-15 report from the IPCC underline the urgency to pursue aggressive mitigation strategies in order to prevent gravely worsening climate change, and that failure to pursue stronger mitigation measures than are currently underway poses a substantial risk to human health. The NCA concludes that the “environmental, economic, and humanitarian risks posed by climate change indicate a pressing need for substantial action to limit the magnitude of climate change and to prepare to adapt to its impacts,” and that “substantial reductions of heat-trapping gas emissions should be among the nation’s highest priorities.” (NCA 2014, p. 816). The failure to mitigate climate change will quickly overwhelm all efforts to prepare for or adapt to the health impacts of climate change. This threat to health due to failure to aggressively and urgently mitigate climate change does not come across strongly in the current report. Because many readers will likely read this assessment of health risks as a standalone document, it is vitally important that this health risk be emphasized in the report.</p> <p>2) Co-Benefits: While the focus of this report is health impacts, a complete picture of the significance of climate change to health requires assessing and quantifying health co-benefits of climate change strategies, as those potential co-benefits address many of our most significant, longstanding health issues. Climate mitigation strategies such as reducing carbon pollution from power plants, increasing community walkability and public transit, tree planting and increasing greenspace in urban areas, and promoting vegetable-based diets and sustainable, local food systems all provide myriad and substantial benefits to health, reducing asthma, obesity, cardiovascular disease, diabetes and more. Broadening the frame of the report to assess co-benefits will provide a more actionable tool that can help guide individuals, communities,</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>agencies and decision-makers.</p> <p>3) Social Determinants of Health and Compounding Impacts: We strongly commend the inclusion of chapter 9, with its focus on populations of concern and its attention to the social determinants of health, and the interwoven factors and other stressors that shape vulnerability to climate impacts. We would also like to see better integration of population health and social determinants of health perspectives throughout the other chapters. Such a perspective would help to highlight otherwise overlooked health impacts related to each of the specific impact areas, such as, the health impacts for farmworkers with job loss resulting from drought or excessive flooding in agricultural regions; or the long term health impacts, including mental health impacts, loss of social connectivity and health impacts from job instability resulting from displacement in connection with extreme storms. In addition, page 3 of this draft states, “While often assessed individually, exposure to multiple threats can occur simultaneously with compounding or cascading health impacts.” The notion of compounding or cascading impacts should be developed throughout the rest of the document, with exploration of how that might affect impacts in each of the areas discussed.</p> <p>4) Capacity Assessment: The report does a good job of assessing many health hazards and risks, but does not look at the capacities of local, state and national organizations, agencies, civic bodies and communities to address those impacts or to optimize co-benefit opportunities. We recommend adding a chapter on adaptation and adaptive capacity. It is important that our government develop the resources to comprehensively deal with adaptation at every level of government, and for public and private entities and communities to jointly engage in community preparedness and resilience efforts. Moreover, we need a fully funded public health infrastructure (including staffing, resources, training and leadership) to reduce deaths, injuries, disease and disability associated with climate change impacts, and to inform mitigation strategies, and inform and implement pursuing health co-benefits from climate strategies.</p> <p>5) Recommendations: What preventive measures can be taken to prevent exposure to the impacts of a changing climate? This report,</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>and each chapter within it, should include recommendations to guide decision-makers, public and private organizations, the public health and health care sectors, and community stakeholders. Recommendations should address both public health policy and practice.</p> <p>To effectively develop the broader climate change and health assessment recommended here, we encourage a process that would engage a broader array of stakeholders in the development of the document, including public health practitioners, health care professionals, federal, state, academic and public health advocacy and environmental organizations. A report that addressed these additional elements would be extremely useful to public health and other sectors.</p> <p>If it is beyond the scope of the current project to undertake a full assessment of health impacts, opportunities, and adaptation capacities and to provide actionable recommendations, we strongly urge USGCRP to undertake that as a near term next project, and to take care, when presenting this report, to present it as an assessment of risks and hazards rather than using the broader “health assessment”.</p> <p>Thank you for the opportunity to comment on this draft report. APHA looks forward to continuing to working with USGCRP as it revises and disseminates this important assessment.</p>					
Justin	G.	This is a very interesting point. I am wondering whether this is true in some rural areas as well, given that various areas in the Great Plains and rural Midwest have sizeable immigrant work-forces performing labor outside during long sumemrs.	Ch 9: Populations of Concern		342	25	Thank you for your positive comment; see also the discussion of outdoor laborers in section 9.4.5. No change made in response to this comment.
Angela	Dyjack	The American Public Health Association is pleased to submit comments in response to the draft USGCRP report The Impacts of	Executive Summary				We greatly appreciate your positive comment about our report and hope that you find the content useful. Revisions have been made to

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>Climate Change on Human Health in the United States: A Scientific Assessment.</p> <p>Overarching Comments:</p> <p>The Executive Summary is an accessible, well-written summary of the current Key Findings of the Public Review Draft report, prefaced by a concise introduction. The nine figures included in the Executive Summary provide a range of important and different concepts and findings as well, although they require a fair amount of contemplation to discern their overarching message. Who is the intended key audience for the report? If aimed at a more technically savvy health user community audience, it means that some of the more complex figures are appropriate as shown.</p> <p>Specific Comments:</p> <p>Missing from the Executive Summary, is a brief explanation somewhere before the Key Findings begin on p.5, regarding the notation of [Likelihood, Confidence] estimates shown at the end of each Key Finding. These are described in Chapter 1, Sec. 1.4.3 on pp.37-38; but this information should either be referenced in the Executive Summary before the Key Findings, or be moved into the Executive Summary.</p> <p>The word “risk” is used differently in the text and in the final figure, and is confusing. It seems correct in the text, but incorrect in the figure.</p> <p>The Conceptual Diagram presented for Climate Change & Health at p. 4</p> <p>This is a useful conceptual diagram, but it should be improved.</p>					<p>the Executive Summary with these considerations in mind. Additional edits to figures (particularly the exposure pathway diagrams) and new figures have been added. As noted in the preface, the intended audience for the assessment is public health officials, urban and disaster response planners, decision makers, and other stakeholders within and outside of government who are interested in better understanding the risks climate change presents to human health. Though not expressly stated in the text, the assessment was written with similar guidance to the National Climate Assessment for writing with clear and accessible language. The entire report aims for a 12th grade reading level, though the content or subject matter may be at a comprehension level closer to the intended audience. Descriptions of the use of likelihood and confidence language are in the Front Matter, the introduction chapter, in detail in the Technical Support Document and Appendix on Likelihood and Confidence, and in every chapter’s Traceable Accounts. Front matter and an appendix also describes the process for drafting the report.</p>

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>Public health infrastructure, including the staffing, resources and training necessary to accomplish all the core public health functions, plays a major role in determining the health outcomes of climate change. It must be given more importance.</p> <p>Points on the diagram:</p> <ul style="list-style-type: none"> • Whether one or two diagrams, we need to list deaths and injuries as health outcomes. • The title “Non-Climate Stressors” is an inadequate descriptor. “Existing Community Hazards” must include industrial facilities and other sources of hazardous chemicals, fuels and radiologicals. • The existing underfunded public health infrastructure should be included in the blue pathway prior to health outcomes. We need to acknowledge the difference between public health programs and access to care. Public health must have a sizeable role in all adaptation efforts at the national, state and local community levels—or we will not be adequately prepared. • In the blue pathway, existing major health problems and inequities should be included after exposure pathways followed by the underfunded public health infrastructure. <p>The notation of [Likelihood, Confidence] estimates are shown at the end of each Key Finding in the Executive Summary, but the notation is not described until Chapter 1, Sec. 1.4.3 on pp.37-38. This information should either be referenced in the Executive Summary before the Key Findings, or be moved into the Executive Summary.</p> <p>Thank you for the opportunity to comment on this draft report. APHA looks forward to continuing to working with USGCRP as it revises and disseminates this important assessment.</p>					
Justin	G.	I think the use of the word "may" dilutes the intended point.	Ch 9: Populatio		343	11	The text has been revised to address this suggestion.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
			ns of Concern				
Justin	G.	I am glad the authors include this sentence.	Ch 9: Populations of Concern		343	14	We appreciate your positive comment.
Angela	Dyjack	<p>The American Public Health Association is pleased to submit comments in response to the draft USGCRP report The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment.</p> <p>Chapter 1: Climate Change and Human Health</p> <p>Overarching Comments:</p> <p>Overall, this chapter is quite useful. The report and the introductory materials in chapter 1 provide an excellent background for readers interested in this subject, but who have not done impacts modeling. In particular, the summary of observed changes in U.S. climate and weather on p. 26, lines 8-25, and the summary of projected changes on p. 27, lines 5-18 (plus graphics) provide a great backdrop. Sec.1.2 (pp.27-28), Sec.1.3 (pp.28-34 and Table 1), and Sec. 1.4 (pp.34-38) are like a mini-textbook on climate-health modeling.</p> <p>Specific Comments:</p> <p>One of the most exciting aspects of the draft report is that new quantitative climate-health modeling projections were utilized in this effort. It would be helpful to readers if the four topic areas and chapters where these quantitative estimates can be found were highlighted more prominently in the Draft Report. Right now, readers have to dig to find on p. 23, lines 30-31 that these are the four topic areas:</p> <ul style="list-style-type: none"> • Temperature-related death and illness 	Ch 1: Preface and Introduction				<p>Thank you for these comments. With regard to giving more prominence to the modeling studies conducted by the federal author teams, a decision was made that these studies are not inherently more valid than other studies in the published literature, and therefore needed to be considered in the context of existing published modeling studies. For that reason, we have summarized those studies in text boxes, but do not believe it is appropriate to imply that these studies carry more weight than other published studies. These will be given a special graphic design treatment to help them stand out visually however in the final report.</p> <p>With regards to e-cigarette smoking rates, we are constrained by space limits as to how many trends may be listed. This section discusses trends in health status as documented by incidence and prevalence of health outcomes, rather than trends in health related behaviors, and the specific trends are mentioned due to their relevance to, and within the context of, climate change.</p>

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<ul style="list-style-type: none"> • Air quality impacts • Water-related illnesses • Vector borne disease <p>Section 1.3.2. pp. 30-31, add e-cigarette smoking rates. This is an increasingly important health risk among youth.</p>					
Justin	G.	Thank you for including this box.	Ch 9: Populations of Concern		352	30	We appreciate your positive comment.
Angela	Dyjack	<p>The American Public Health Association is pleased to submit comments in response to the draft USGCRP report The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment.</p> <p>Chapter 2: Temperature Related Death and Illness</p> <p>Overarching Comments:</p> <p>It is an important feature that this chapter, like the others in the report, includes the material on Populations of Concern, Emerging and Cross-Cutting Issues, Research Needs, and Traceable Accounts. These all provide important discussion and a way of unifying the chapters. However, it seems like parallel sections on Adaptation/Preparedness Priorities should be included as well. The public health community is one where prevention of harm is the necessary next step in almost any research effort, and it seems the draft is missing that important discussion. We suggest including more material on preparedness.</p> <p>Specific Comments:</p>	Ch 2: Temperature-Related Impacts				<p>Inclusion of a new section on Adaptation/Preparedness Priorities in this and other chapters is beyond the original scope of the report which was constrained to provide a summary of current evidence with respect to the risks and impacts associated with climate change to health in the United States and explicitly was not going to address adaptation with priorities and/or recommendations.</p> <p>The text for Key Finding 1 has been revised to address this and other comments.</p> <p>Changes to the Traceable Accounts on page 66 have been made to address the comment about timing. Addressing the comment regarding the mapping of study populations is beyond the scope of this report.</p> <p>Gasparri et al. and other relevant works have been incorporated as part of the process of public comment response process.</p>

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<ul style="list-style-type: none"> • Key Finding 1, p. 51, lines 3-4: “Future climate warming could lead to thousands to tens of thousands of additional deaths each year from heat in the summer...” – add “by 2100” or “by the end of the century” to provide a time frame. • P. 66, line 20, similar to comment above, add “each year by the end of the century” after “...additional deaths from heat in the summer...” • P. 66, line 23, mention is made of “...heat mortality projections in the United States for at least 10% of the U.S. population...” – it would be interesting to see a map of where those areas are, from the studies cited, as another resource for areas where data is available. • P. 67, lines 14-17: is there a particular publication date past which this effort will not consider new research findings? These lines reference four new papers on heat-related mortality projections for the U.S. that have been released since the NCA3 launched in May 2014. A new multi-country retrospective paper was just released in The Lancet (Gasparrini et al. 2015, online May 21, 2015, available at: http://dx.doi.org/10.1016/S0140-6736(14)62114-0), which suggests that most of the mortality burden in many countries was attributable to the contribution of cold. If there’s no cut-off date, this paper could be included since it presents a counterpoint to what’s written here, with important methodological differences. • P. 72, lines 1-15: strong points made concerning social determinants of heat vulnerability, and mental health-related risk factors. • The figures provide strong graphic representation of the evidence and concepts in the draft chapter; some specific comments follow: • Figure 1, p. 82 – include brief mention within the center dark blue portion of figure “ER/hospital visits” for what types of illnesses (respiratory, cardiovascular, kidney for example. In the green section on right, add in third bullet, “English language competency” that this can affect risk communication. 					<p>Suggested revisions to Figures 1-3 have been considered and changes made as appropriate.</p> <p>Regarding Figure 4, text has been added to the research highlights box that relates the use of six-month periods to account for impacts over the entire year. While space constraints limit the ability to describe this work in depth, the underlying study itself does not examine the sensitivity of the results to use of hotter and colder periods that vary from a 6-month definition or different 6-month definitions.</p>

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<ul style="list-style-type: none"> • Figure 2, p. 83 - include in caption what the blue shaded section means. • Figure 3, p. 84 – So readers know this is a future temperature modeling study, suggest adding to title after “Projected Net Changes...” “by 2100, relative to 2010, in 209 U.S. cities”. Would also be helpful to create a map version that shows percentage changes in heat-related mortality. The report now says (p. 61, lines 12-13 and lines 16-17) “Further details can be found in Schwartz et al. 2014...” “Overall, this leads to a total net increase of about 2,000 to 10,000 deaths per year in the 209 cities by the end of the century (Figure 4).” • Figure 4, p.85 – it is unusual to divide the entire year into two 6-month periods of “heat” (April-Sept) and “cold” (Oct-March), and more typical to model 3-month seasons i.e. summer as June-July-August, winter as Dec-January-February. The modeling work description on pp. 61-62 is rather abbreviated; add brief discussion of the possible effects of applying the 6-month cold vs. hot periods. 					
Justin	G.	Unfortunately, I don't understand the need for this portion as it reads more as a section discussing how geographical data could be used for (any type of) disaster management and why this practice is important. GIS has been used for this purpose since at least 2000 if not earlier.	Ch 9: Populations of Concern		355	21	This section provides previous research that has been conducted on mapping populations of concern. The audience of this document includes those that are not familiar with Geographic Information Systems and creation of vulnerability indices. This section is important because it provides practical examples of how to measure and map populations of concern and vulnerable populations so that decisions makers, health scientists, and public health officials can better focus health interventions.
Angela	Dyjack	The American Public Health Association is pleased to submit comments in response to the draft USGCRP report The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment.	Ch 3: Air Quality				The asthma rate was corrected in both locations.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>Chapter 3: Air Quality Impacts</p> <ul style="list-style-type: none"> • Page 99 line 27. Children can be added to the sentence. • Page 99 line 31. Children with asthma rate should be 6.8 M, not 4.8 M. (They have the correct number on page 346 of report) • Page 100 line 5. Reference is missing. • Page 103 line 38. Incorrect asthma rate again. Should be 6.8 M 					
Angela	Dyjack	<p>The American Public Health Association is pleased to submit comments in response to the draft USGCRP report The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment.</p> <p>Chapter 4: Vectorborne Disease</p> <p>The USGCRP Vectorborne disease chapter completes a much more comprehensive assessment of the potential impacts of climate change on existing vectors and vector borne disease than the 2014 NCA. In the NCA, there is a feature on potential impacts of climate change on the tickborne transmission of Lyme disease, but not much detail in regards to mosquitoborne West Nile Virus, or any other vectorborne disease. This chapter is very well-written and thoughtfully prepared.</p> <p>In regards to authorship of this USGCRP Vectorborne disease chapter, the majority of the authors work for or closely with the Centers for Disease Control and Prevention’s National Center for Emerging Zoonotic and Infectious Diseases and the National Center for Atmospheric Research. Many of the authors have published in peer-reviewed journals relating to vectorborne disease and climate change impacts.</p>	Ch 4: Vectorborne Diseases				<p>We greatly appreciate your positive comment.</p> <p>The text has been modified in the Populations of Concern section, as the authors feel this is the most appropriate place for a brief discussion of prevention activities that may reduce vulnerability to vectorborne diseases. A detailed discussion of VBD prevention goes beyond the scope of the chapter.</p> <p>To the best of the authors’ knowledge there are no other United States based, national-level assessments of the impacts of climate change on vectorborne disease, but there are other Non-US-level assessments, such as the report on “Climate change, impacts and vulnerability in Europe, 2012.” by the European Environmental Agency.</p>

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>One could argue that this assessment could be more quantitative in terms of elucidating the vectorborne disease-related health outcomes in the U.S.; however, as this document clearly states, these diseases have not been present in the U.S. recently (Lyme Disease in 1991, West Nile Virus in 1999), so it is difficult to observe responses to climate change trends. Thus, this document highlights the state of the science regarding the responses of Lyme disease and West Nile Virus to key weather variables. This chapter more than adequately highlights the leading research on climate impacts on the vectorborne diseases of Lyme disease and West Nile Virus.</p> <p>The diagrams and figures used in the Vectorborne Disease chapter are excellent and very explanatory.</p> <p>Specific Comments:</p> <ul style="list-style-type: none"> • Section 4.5 Populations of Concern – thoughtfully written and important. This could be an opportunity to highlight and explain potential opportunities for prevention. Or, a separate section for recommendations for prevention of transmission, as these vectorborne diseases become more prevalent. The only other mention of factors that reduce exposure can be found on pg 125, lines 35-37, where authors mention “use of air conditioning, screens on windows, and vector control public health practices.” Vector control public health practices aren’t defined or explained. We recommend expanding this section to incorporate these recommendations. • Are there any other national assessments of impacts of a changing climate on vectorborne disease that haven’t been included in this document? 					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
Justin	G.	Incomplete reference.	Ch 9: Populations of Concern		374	33	All references have been edited for accuracy and consistency with the Style Guide for the report.
Justin	G.	Incomplete reference.	Ch 9: Populations of Concern		377	42	All references have been edited for accuracy and consistency with the Style Guide for the report.
Justin	G.	Incomplete reference.	Ch 9: Populations of Concern		381	15	All references have been edited for accuracy and consistency with the Style Guide for the report.
Angela	Dyjack	<p>The American Public Health Association is pleased to submit comments in response to the draft USGCRP report The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment.</p> <p>Chapter 5: Water-Related Illness</p> <p>Overall comments: Strengths for this chapter include a relatively thorough look at water-related illness climate-associated impacts, including from point and nonpoint sources, microbial and chemical contamination, etc. Also, the chapter is logically presented from source to exposure to impacts. Importantly, populations of concern are also highlighted.</p> <p>Some weaknesses include notable omissions from the discussion of water-related illness such as: 1) the importance of regional variability associated with climate driven hydrological impacts and, in turn water-related illness; and 2) impacts associated with alterations to annual snowpack and snowmelt (e.g. water availability/quantity and quality). Highly regionalized variations in water-related illness should be discussed (or at least mentioned) in Section(s) 5.2 and/or 5.3, and a discussion of climate change-induced shifting patterns in snowpack/snowmelt (and possibly</p>	Ch 5: Water-Related Illness				<p>We agree that regional variability is important, and the chapter draft already included numerous regional examples—for example, related to combined sewer overflows in the Great Lakes region and all of the research highlights that are regionally focused. Where possible, we have revised the text to include more detail on regional U.S. impacts. This includes new regionally focused text on the possible health implications of reduced drinking water quality and availability/supply associated with drought (primarily the Southwest), snowpack changes (primarily Western states), and saltwater intrusion (primarily the East and Gulf coasts).</p> <p>Regarding the percentages that add to over 100%, the draft had already included an explanatory footnote. The chapter has since been revised to remove the footnote for style purposes, but the content has been retained in the new body text.</p> <p>See the Front Matter (About the Report) for an overview of the purpose of the Traceable Accounts from the perspective of the entire report. The Traceable Accounts for this chapter</p>

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>glacial mass balance) should be addressed.</p> <p>Additional specific comments:</p> <ul style="list-style-type: none"> • Section 4.1, lines 4-6: this needs clarifying, when reading it appears that the percentages should add to 100% (or near it), but not over as indicated (i.e. 90% +15, as this will likely cause confusion. • Section 5.8, “Traceable accounts” comes across confusing and possibly out of place; clarification on this terminology, in particular discussions of confidence and uncertainty are necessary. 					<p>have been revised for clarity and to better reflect the state of the science with regard to the Key Findings.</p>
Angela	Dyjack	<p>The American Public Health Association is pleased to submit comments in response to the draft USGCRP report The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment.</p> <p>Chapter 6: Food Safety, Nutrition and Distribution</p> <p>This chapter does a good job of identifying and assessing many of the hazards and risks associated with climate change impacts and projected impacts on food safety, nutrition and food distribution, with good detail on the issues it addresses.</p> <p>The chapter would be strengthened by a broader consideration of the health impacts of significant potential changes to systems of food production and distribution that may be required as growing seasons, precipitation patterns, average temperatures and local pests and weeds change, and as water tables drop due to excessive use of groundwater.</p> <p>The chapter should consider addressing:</p>	Ch 6: Food Safety				<p>Positive comments are appreciated. As noted in the introduction section, discussion of climate impacts on food production or health impacts associated with changes in food production, are beyond the scope of this chapter. References are provided in the text for discussion of this topic elsewhere. A finding from the USDA Food Security Report has also been added to the introduction text to help highlight the importance of this topic while noting it is beyond the scope of this report.</p> <p>There is not sufficient evidence in the peer-reviewed literature that climate impacts on drought will lead to instances of water shortages that would lead to consumers substituting soft drinks for drinking water which would lead to negative health impacts attributable to climate change. Many of these secondary or indirect health impacts are also outside the scope of the report. As noted in the Introduction, impacts on production, price, trade, or other economic impacts on the agricultural sector, including job loss, are beyond the scope of this chapter (references for additional information on these topics are provided). Increased need for pesticide use is covered within this chapter.</p>

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<ul style="list-style-type: none"> • Nutritional impacts of water supply contamination, such as increased consumption of sugary beverages because local water supplies are contaminated or insufficient, and bottled water is more expensive than soda. • The need to change crop varieties in order to adapt to changed temperatures, growing seasons, precipitation levels, water availability and other ecological changes. • Health impacts of job loss in agricultural communities and localized impacts on availability of fresh foods in vulnerable agricultural communities. While this is touched on in chapter 9, it should also be addressed here to provide a more integrated and holistic account of the health impacts of climate change. • Health impacts of increased greenhouse gas emissions resulting from the need for increased use of pesticides. • The potential for health co-benefits by promoting decreased red meat consumption and increased plant-based diet, which would contribute to mitigating climate change, would help decrease chronic diseases such as cardiovascular disease, diabetes and obesity. • Increasing sustainable agricultural practices would reduce greenhouse gas emissions from pesticide and fertilizer production and use, which would protect health by mitigating climate change. • Sustainable agricultural practices can also help to capture and sequester carbon dioxide, thus mitigating climate change and thereby protecting health. The agricultural industry has significant potential to be an important contributor to climate change solutions, with important near term co-benefits to health along with the health benefit of mitigating climate change. • Strengthening local food systems, such as through support for community and school gardens, farm to fork programs, farmers market vouchers and EBT programs, etc., offers health co-benefits 					<p>Overall, adaptation, and health benefits or co-benefits associated with adaptive responses, are beyond the scope of the report. However, text has been added to the chapter to incorporate the role of adaptive capacity in understanding projected health outcomes, and information on adaptive capacity has also been added to the Front Matter. As noted in the Front Matter for this report, mitigation, adaptation or economic valuation is outside the scope of this report.</p>

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>through healthier diet, increased social connectivity, smaller carbon footprint for food distribution, and increased exposure to nature.</p> <ul style="list-style-type: none"> • With respect to groundwater use, the effects of hydraulic fracturing on water availability and quality for agriculture should be considered. 					
Angela	Dyjack	<p>The American Public Health Association is pleased to submit comments in response to the draft USGCRP report The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment.</p> <p>Chapter 7: Extreme Weather</p> <p>1) We urge better inclusion of some of the important quantitative data from the NCA, such as the increasing length of the wildfire season in many areas. Like other scientists, health professionals better grasp the significance to health when such significance is associated with data. The Quebec fire in 2002 that resulted in a 30-fold increase in airborne fine particulate matter in Baltimore, Maryland, over 1,000 miles away is such an example. (NCA Chapter 9).</p> <p>2) The need to recognize uncertainty. Section 7.11 Traceable Accounts. We have no understanding here of the meaning of traceable accounts. However, these pages 268- 272 do discuss uncertainty, although the discussion is disorganized. We recommend referring back to the NCA and clarifying those areas where we have high and medium confidence in a climate change effect—using very clear language. A section that discusses limited evidence and why the evidence is limited is also appropriate—labeling it as such (p. 269). However, we believe areas of uncertainty have been overemphasized compared to what we are reasonably confident of. Despite having an extensive bibliography for this chapter, the level of uncertainty is described as greater than in the NCA. We need clear statements of areas where we have the greatest confidence of the connection to climate change and then a more complete description of where we would like to have better</p>	Ch 7: Extreme Events				<p>We greatly appreciate the thoughtful suggestions and have provided individual responses below.</p> <p>Response 1: The text has been revised to incorporate this suggestion.</p> <p>Response 2: The text has been revised to incorporate this suggestion.</p> <p>Response 3: We appreciate the suggestion, but the author team has deliberated and decided not to make changes to the current figure. The objective of this figure is to show statistics demonstrating the human and economic costs of extreme weather events over this time period and not necessarily to link these weather events to climate change. No change has been made to the text.</p> <p>Response 4: We appreciate this suggestion. The text has been revised to incorporate this suggestion.</p> <p>Response 5: The authors have decided not to revise the subheader title for section 7.5. No change has been made to the text.</p> <p>Response 6: The text has been revised to mention that wildfire smoke includes toxic chemicals, but due to space limitations, the authors have decided not to include additional</p>

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>information. Obviously, not all of the NCA data can be included, but some is appropriate.</p> <p>3) Figure 1, is potentially misleading. Those items that have less certainty as associated with climate change should be moved and grouped together. Otherwise the figure is saying we are certain all these things are associated with climate change. The same chart could be used with a split or divider – illustrating that tornados, lightning and wind storms are less certain than other extreme events (as stated in the text below this figure). With total deaths on the Y-axis, total \$ losses can be provided on each of the bars in the bar graph—\$392B.</p> <p>4) Section 7.4 Cascading Failures to Essential Infrastructure. This is a very important section. Advanced technology has connected many of the systems in modern society to each other. This results in the potential for additive and synergistic adverse impacts to a single event. We appreciate the mention of our aging infrastructure and the lack of investment in it. The recent grade of D+ by the American Society of Civil Engineers should be mentioned here. In the context of the hazards of an extreme event and related cascading failures that can be catastrophic, we must begin to include existing technological hazards that are part and parcel of our modern lives in all climate assessments. Extreme weather events interact with a host of different kinds of hazardous facilities, hazardous chemical storage, nuclear sites and radiological facilities, degraded 100-year-old pipelines, etc. In order to prepare for climate change and extreme weather events, we must understand the location and nature of existing and hazardous facilities. Preparing communities to deal proactively with such hazards may be cost effective and avoid diverting essential emergency response from human needs during a disaster.</p> <p>5) Section 7.5 Flooding and Other Health Hazards associated with Extreme Precipitation, Hurricanes and Coastal Storms. This title is unlike that for all the other extreme events and also confusing. All of the issues raised can lead to flooding. We recommend Extreme Precipitation, Hurricanes, Coastal Storms and Flooding as a title. If we direct all the national attention to our coasts, we will miss important opportunities for preparedness and community resilience</p>					<p>detail about the specific toxic compounds found in wildfire smoke. The reader has also been referred to the Air Quality chapter for more information.</p> <p>Response 7: We appreciate the suggestion with additional references; however, space is limited. The author team has deliberated and agreed on the most important information and illustrations to include. The authors have decided to not include a more in-depth mention of physician experience with impacts of extreme events and related citations. No change has been made to the text.</p>

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>in other flood prone areas.</p> <p>6) Wildfires—A large number of air pollutants associated with wildfires cause inflammation of the respiratory tract. Ozone and particulate matter as criteria pollutants are most often cited. However, acrolein is produced in fires, and also causes respiratory inflammation. As such, such additional toxic pollutants should be addressed or acknowledged.</p> <p>7) Droughts—Droughts pose challenges to business and industry related to agricultural production and the economy, and create adversarial and difficult political situations.</p>					
Angela	Dyjack	<p>The American Public Health Association is pleased to submit comments in response to the draft USGCRP report The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment.</p> <p>Chapter 8: Mental Health and Well-Being</p> <p>While the content of this chapter is strong, the reader would be well served by better organization and signposting. In the introduction, there should be a set of bullets or other listing approach, to let the reader know what is coming in the rest of the chapter. When the individual sections begin, such as the first on Extreme Weather Events, each paragraph should indicate the topic of the paragraph with a word at the beginning, before the text of the paragraph starts. There is a great deal of valuable information in this chapter, but it becomes difficult to follow because of the lack of such simple signposts.</p> <p>Figures:</p> <p>First figure: lacks any listing of the higher risk groups. These should be in that figure.</p>	Ch 8: Mental Health				<p>Thank you for your comments. We have reviewed these suggestions regarding the figure with the graphic design team. As these graphic elements (icons) apply to the entire document, consistency will need to be maintained, but certain changes for clarity can also be made. We changed the sun to a thermometer icon and decided to add an air quality icon to the climate impacts circle.</p>

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>Second figure:</p> <ul style="list-style-type: none"> • The wave over the houses is difficult to interpret in that it looks like a tsunami. If it is intended to be sea level rise, it should be possible to display that more effectively. • The sun conveys a happy message rather than baking heat, which would seem to be the intention. • A thermometer with a max reading would seem to be a more effective approach to conveying this message. • On the right side of that figure where "Medical and Physical Health" effects are listed, air quality should be included instead of "fitness and activity level." 					
Angela	Dyjack	<p>The American Public Health Association is pleased to submit comments in response to the draft USGCRP report The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment.</p> <p>Chapter 9: Climate-Health Risk Factors and Populations of Concern</p> <p>A strong part of this chapter is Section 9.7 Traceable Accounts, although that title is confusing as it is not clear what it means. The section summarizes the key findings on Populations of Concern in a very clear and concise manner. In fact, it might be a better lead-in to the chapter, as it explains the process by which the conclusions were determined. It could be followed or combined with 9.3 A Framework for Understanding Vulnerability, and then continue with the data on populations of concern.</p>	Ch 9: Populations of Concern				<p>Thank you. We have considered the merits of reorganizing the chapter and conclude that the current organization is optimal.</p> <p>The term Hispanic is used throughout the document. We have concluded that it is more appropriate to use the word Latino rather than Hispanic as we are mostly referring to persons from North, Central, and South America and the Caribbean, rather than Spain.</p> <p>Figure 2 (Social Determinants of Health) has been completely revised in response to this and other comments. It now focuses on how the Social Determinants of Health feed into the Elements of Vulnerability to ultimately affect health outcomes. We have also added illustrative examples to help explain the points. In addition, the chapter text has been revised to incorporate the specific line-by-line edits provided by the commenter.</p>

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>The term Hispanic is used throughout the document. We believe it is more appropriate to use the word Latino rather than Hispanic in this document as we are largely referring to persons from North, Central, and South America and the Caribbean, rather than from Spain. However, Hispanic/Latino would be most inclusive.</p> <p>Figure 2 fails to relate to the description of the Framework given in the text. Perhaps it can be excluded and the explanation in the text can focus on the points it wishes to make.</p> <p>A few line-by-line comments:</p> <ul style="list-style-type: none"> • Page 339, line 30: add “and other air pollutants” after aeroallergens. • Line 6 p. 340 and elsewhere: Condition of Infrastructure should include some reference to “access” to infrastructure, for example, access to communication infrastructure can influence a person's vulnerability. • Page 341, line 6: (See Section 9.2.2) should be (see Section 9.3.2). There is no section 9.2.2. • Page 342, line 11, insert 'inadequate' before access to health care. Line 21, insert 'such as' after adaptation measures, and give an example. • Page 342, line 18: insert “lack of access to emergency communications” after “poor quality housing”. • Page 343, line 11: Food safety and security. It is unclear what is meant by the first sentence about nutritional content, and it would be helpful to the reader to have some short explanation in addition to being referred to another chapter for clarification. The remainder 					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>of that paragraph does not seem to be climate change related.</p> <ul style="list-style-type: none"> • Page 343, line 18: Psychological stress. Please note, stress-related mental health impacts are also due to greater vulnerability, not just access to mental health care. • Page 344, line 15: The sentence on mercury exposure puts it so mildly that it loses importance. Mercury also affects all life stages as it is a potent neurotoxin. This paragraph could be strengthened by some reference to salmon in the western and northwestern U.S. (The whole chapter seems weighted toward data from the eastern U.S.) • Page 347 line 16: Food safety and security. Insert “increasing costs” after “affecting supplies”. • Page 349, lines 31-37: Other weather extremes. This paragraph is very well written, clear and concise and could be duplicated in other sections for better clarity. • Page 351, 9.4.5. Occupational Groups. This section speaks only about outdoor workers, who may be at great and most obvious risk, but warehouse workers, for example, with no air conditioning and demanding workloads and speeds with few breaks for water, restroom, or meals, are also at high risk for heat-related illness, especially in cases where employers manage from air conditioned offices. Management's awareness of changes in conditions in the workplace as a result of climate change will influence the level of exposure of employees to extreme conditions, both indoors and outdoors. • Page 354. Line 27: “Table 1 in the Introduction chapter”. The title of that chapter is “Climate Change and Human Health”, not Introduction. Same comment applies to line 30. 					
Justin	G.	I suggest standardizing the references so that URLs aren't provided in addition to dois (where they exist).					All references are in standardized format in the final report.
Justin	G.	Many of the references without dois link to the pubmed URL in-lieu of the landing page for the specific article. Please inform whether this is common practice in the health field (in which case					All references are in standardized format in the final report.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		this all right assuming it's consistent). If this is an error, then the landing page of the specific article should be cited in-lieu of the pubmed page.					
Justin	G.	The bibliography contains inconsistent formatting of entries (e.g. all lower-case first letters of report and article titles in some places and not in others, etc.	Ch 9: Populations of Concern				The references have been reviewed and edited for content and consistency.
Howard	Feldman	<p>Appendix 1: Technical Support Document</p> <p>General Comments</p> <p>The Technical Support documentation provides insufficient detail to fully evaluate the quantitative health impact modeling aspects of the report. Appendix 1 provides only a high level description of the health modeling, focusing mostly on climate change models and emission scenario development and evolution. Based on the earlier Final Prospectus and the literature, it is clear that climate change health impact modeling is a nascent area. The Final Prospectus stated: “[b]ecause the impacts of climate change on health are complex and often dependent on multiple confounding socioeconomic and environmental factors, the methodology for developing appropriate climate and health indicators is challenging and still emerging.” Accordingly, given that these newly developed models have not been extensively reviewed or widely accepted by the broader scientific community (and typically are not publicly available), reliance on these models for establishing conclusions warrant a more comprehensive and rigorous discussion of their validity and relevance. As noted by Ebi and Rocklov, (2013) it is important that models be validated using data not used in model fitting to avoid over-fitting and to increase confidence in the predictive accuracy for new situations. Additionally, even if the model has been validated in one community over a particular time period, it may not provide valid predictions in other communities or on other time scales. Unfortunately, the draft report provides no discussion of the modeling in this regard, and it must be revised to include such information. Finally, considering the novelty of the models, it is critical to examine how model selection impacts the health effects conclusion, and to evaluate the sensitivity of models to assumptions. Again, no such discussion in this regard is provided in the draft report.</p>	App 1 (Ch 10): Technical Support Document				Because the report does not include use of one standard quantitative modeling approach across topics, health outcomes, or chapters, the purpose of the appendix was to provide readers with high level descriptions of methods and uncertainties associated with projecting climate impacts, socioeconomic development, and health outcomes. Therefore the methods used in the quantitative modeling described throughout the report (including validation or sensitivity analyses within these studies), including those highlighted, can be found in the underlying peer reviewed journals from which the results are reported. The topic of validity, in terms of the validity of the findings, has been addressed by the development of an Appendix on Documenting Uncertainty: Confidence and Likelihood. Any sensitivity analyses conducted for the separate modeling analyses assessed would similarly be reported in the underlying peer reviewed sources. Model sensitivity assumptions of the studies highlighted within the Research Highlights sections of this report are described in the section on Modeling Highlighted in the Assessment, as well as Figure 4. Uncertainties regarding timescales and geographic scales broadly across multiple modeling approaches are described in section on Sources of Uncertainty. The authors disagree that the statement on recent progress in model development is not justified, and have provided additional references to further clarify. In regards to the commenter’s

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>Some high level descriptions of the inputs required are provided for the different health impacts assessed (see page 395, lines 21-30). Additionally, some data sources are described (e.g., the Integrated Climate and Land use Scenarios (ICLUS) model for population and the Environmental Benefits Mapping and Analysis Program (BenMAP) model for baseline mortality data) (again see page 395, lines 21-30). However, no further details or specifics about the models used to integrate these data inputs and sources and ultimately to project disease impacts is provided.</p> <p>A section of the appendix is devoted to sources of uncertainty (Section A1.3, page 396). It is critical for the authors to provide a full and comprehensive description of the major uncertainties and limitations inherent in the current state of knowledge, as well as the implications of these uncertainties to the conclusions. The statement on page 396, lines 14-16 that “recent years have seen considerable progress in the development of improved methods to describe and deal with uncertainty in modeling climate change impacts on human health” is not justified with supporting evidence. While this statement may be true for modeling climate change, it is equally plausible that it may not be. It is seemingly a major overstatement of the current state of uncertainty assessment for health impacts potentially due to climate change.</p> <p>As part of the uncertainty section of the appendix (see Section A1.3.3, page 398, lines 7-16), the authors touch very briefly on the issue differentiating between exposure-disease relationships that are correlative versus causative. To make this differentiation, a weight of evidence approach is required to integrate the evidence and provide a robust interpretation of the results (i.e. assumptions applied, how conclusions were reached, and how alternative conclusions were excluded). Notably, in 2011, the National Research Council (NRC) published a Review of the Environmental Protection Agency’s Draft IRIS Assessment of Formaldehyde. In this assessment, the NRC looked beyond the formaldehyde assessment and provided a roadmap to the Agency for conducting rigorous, transparent scientific reviews of human health risks</p>					<p>statements on exposure-disease relationships, the text in this section has been edited to clarify that authors are presenting an example. The USGCRP Climate and Health Assessment is a highly influential scientific assessment (HISA) and follows the Information Quality Act (IQA) guidelines. As such, literature review guidance and weight of evidence guidelines were used in the development of this assessment. These processes have been described in a newly developed Appendix on the Process for Literature Review which describes the identification of literature sources and screening for eligibility, and includes a citation used for determining screening criteria.</p>

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		<p>associated with substances. While evaluating potential health risks of climate change is clearly different than estimating health risks associated with a single substance, several of the NRC recommendations are applicable to the climate change health impacts report, such as:</p> <ul style="list-style-type: none"> • Use of standardized evidence tables for each health outcome rather than long descriptions of particular studies. • Standardized approaches for review and evaluation among contributors to assessments to ensure uniformity of evaluation. • Full descriptions of the methods of the assessment, including literature search strategies, exclusion and inclusion criteria clearly articulated, and detailed description of the outcomes of the search (a graphical model for displaying results of literature searches is provided). • A standardized approach to using weight of evidence guidelines. • Thorough evaluation of critical studies with standardized approaches that are clearly formulated and based on the type of research being considered. • Strengthened, more integrative and more transparent discussions of weight of evidence methods used. <p>None of the above approaches were used in the report. Rather, the report provides a superficial, uncritical review of the selected evidence and seems to take all reported associations to be causative. A far more rigorous review is necessary.</p> <p>References</p> <p>Ebi KL, Rocklov J, 2013. Climate change and health modeling: horses for courses. Global Health Action 7:1-5.</p>					

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		US National Research Council Committee, & US NRC Committee, 2011 to Review EPA's Draft IRIS Assessment of Formaldehyde. Review of the Environmental Protection Agency's Draft Risk Assessment of Formaldehyde.					
Justin	G.	I suggest prefacing the "www." with "http://" in order to be consistent with the other entries.	Executive Summary		21	13	All reference formats are standardized in the final report.
howard	feldman	The report states that “despite these challenges, health impact modeling continues to improve, increasing our understanding of the quantitative impacts associated with climate change”. This statement implies that the validity, relevance and sensitivity of available models have been tested, at least minimally, resulting in the continued improvement, as suggested; however, information in this regard is not provided. To the extent it exists, that information must be provided and fully explained. Indeed, it is possible that the authors are referring only to climate change models and not health impact models. If so, this should be clarified.	App 1 (Ch 10): Technical Support Document		391	19	References have been added to clarify and support this statement.
howard	feldman	This section of the Appendix devotes considerable discussion to Share Socioeconomic Pathways (SSPs), yet it is stated that SSPs “are not explicitly used in the analyses highlighted in this assessment, but as they are scenarios likely to be used by the impacts modeling community over the next few years, placing the current work in context is a valuable exercise”.	App 1 (Ch 10): Technical Support Document		392	19	No suggestion or edit proposed by the comment.
howard	feldman	This section of the Appendix devotes considerable discussion to Share Socioeconomic Pathways (SSPs), yet it is stated that SSPs “are not explicitly used in the analyses highlighted in this assessment, but as they are scenarios likely to be used by the impacts modeling community over the next few years, placing the current work in context is a valuable exercise”.	App 1 (Ch 10): Technical Support Document		393	1	No suggestion or edit proposed by the comment.
howard	feldman	The authors state “though quantitative evaluations of climate change impacts on human health are continually improving,...”. This statement implies that models have undergone some degree of testing and refinement (hence improvements), yet no data are provided to support such model development activity. Rather, the field of climate change health impact modeling is a still developing, nascent field with considerable uncertainty associated with it.	App 1 (Ch 10): Technical Support Document		396	7	References have been added to this section to clarify and support this statement.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
howard	feldman	<p>Chapter 1 provides an introductory overview of the USGCRP, its objectives and general structure of the report. In the preface section (lines 9-12) there is reference to the third NCA report authored by Melillo et al. 2014a. It appears that the USGCRP report is largely based on Chapter 9 (Human Health) of the Melillo et al. 2014a report, minus key critical details and caveats. In fact, the authors of this USGCRP report on climate and health state that the report "...updates and builds upon the health chapter of the third NCA (Luber et al. 2014)" (page 23, lines 24-25) but it is difficult to see how the USGCRP report "builds upon" the Luber et al. 2014 report. Rather, the Human Health chapter by Luber et al. 2014 provides a fuller description of key assumptions and uncertainties underlying disease impact estimates, and more contextual information to put those estimates into perspective. Specific examples from Luber et al. 2014 in this regard are provided below (underline added for emphasis).</p> <ul style="list-style-type: none"> • Estimates made assuming no change in regulatory controls or population characteristics have ranged from 1,000 to 4,300 additional premature deaths nationally per year by 2050 from combined ozone and particle health effects. • To the extent that increased pollen exposures occur, patients and their physicians will face increased challenges in maintaining adequate asthma control. • Some of the risks of heat-related sickness and death have diminished in recent decades, possibly due to better forecasting, heat-health early warning systems, and/or increased access to air conditioning for the U.S. population. However, extreme heat events remain a cause of preventable death nationwide. Urban heat islands, combined with an aging population and increased urbanization, are projected to increase the vulnerability of urban populations to heat-related health impacts in the future (Ch. 11: Urban). • While deaths and injuries related to extreme cold events are projected to decline due to climate change, these reductions are not 	Ch 1: Preface and Introduction				<p>This health assessment builds off of the NCA report and specifically NCA Chapter 9 in that it includes an updated literature review and inclusion of recent analyses quantifying impacts of climate change on health. As outlined in the Front Matter, where appropriate, emissions projections and adaptive capacity are included in the analyses summarized in this report, depending on the underlying source. For instance, impacts of regulation are considered in the research highlight on ozone impacts. Adaptive capacity, including use of air conditioning, is considered in the analysis on heat health outcomes highlighted in the report. This important contextual information is not excluded from the report; however, policy issues are beyond the defined scope of the Climate and Health Assessment, a scientific document that summarizes published literature on health impacts. The report may provide input for decision making, but it does not address or recommend policy. For more information on uncertainty, please see the technical support document (appendix) or the underlying sources for the analyses cited. Additional detail (including a figure) on uncertainty has been added to both the Introduction chapter and the Technical Support Document (appendix).</p>

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		<p>expected to compensate for the increase in heat-related deaths.</p> <ul style="list-style-type: none"> • Elevated waterborne disease outbreaks have been reported in the weeks following heavy rainfall, although other variables may affect these associations. • Whether climate change in the U.S. will increase the chances of domestically acquiring diseases such as dengue fever is uncertain, due to vector-control efforts and lifestyle factors, such as time spent indoors, that reduce human-insect contact. Infectious disease transmission is sensitive to local, small-scale differences in weather, human modification of the landscape, the diversity of animal hosts, and human behavior that affects vector-human contact, among other factors. There is a need for finer-scale, long-term studies to help quantify the relationships among weather variables, vector range, and vector-borne pathogen occurrence, the consequences of shifting distributions of vectors and pathogens, and the impacts on human behavior. Enhanced vector surveillance and human disease tracking are needed to address these concerns. • While the U.S. will be less affected than some other countries, the nation will not be immune (note: This statement refers to food security) <p>The above examples are important for providing readers with a balanced and full picture of the science underlying estimated health impacts of climate change. Accordingly, it is unclear why the authors have chosen to exclude this important contextual information from their report. The stated goal of the report was to "...inform public health officials, urban and disaster response planners, decision makers, and other stake holders within and outside of government who are interested in better understanding the risks climate change presents to human health" (page 23, lines 16-18). A full set of information on underlying assumptions and uncertainties and contextual information, would provide decision makers and planners with the best available understanding of climate change health risks.</p>					

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		<p>While the report provides a description of uncertainty in health impact assessment (section 1.4.2, pages 36-37) and the approach used to quantify uncertainty in the report (section 1.4.3, pages 37-38), the approach is insufficient to fully capture the significant uncertainties associated with the estimates. There are significant uncertainties associated with each part of the causal chain being modeled (e.g., climate change, the role of population changes, and the impact of those changes on health outcomes), and when these uncertainties are combined in the final modeling, the approach taken in the report is insufficient to completely communicate those uncertainties.</p> <p>Chapter 1 References</p> <p>CBO, 2013: Modeling Individual Earnings in CBO’s Long-term Microsimulation Model. Working Paper 2013-04. Government Printing Office, Washington, DC. [Available online at http://www.cbo.gov/sites/default/files/cbofiles/attachments/44306_CBOLT.pdf]</p> <p>Luber, G., K. Knowlton, J. Balbus, H. Frumkin, M. Hayden, J. Hess, M. McGeehin, N. Sheats, L. Backer, C. B. Beard, K. L. Ebi, E. Maibach, R. S. Ostfeld, C. Wiedinmyer, E. Zielinski-Gutiérrez, and L. Ziska, 2014: Ch. 9: Human Health. Climate Change Impacts in the United States: The Third National Climate Assessment, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds., U.S. Global Change Research Program, 220-256. [Available online at http://nca2014.globalchange.gov/report/sectors/human-health]</p> <p>Melillo, J. M., Terese (T.C.) Richmond, and G. W. Yohe, Eds., 2014a: Climate Change Impacts in the United States: The Third National Climate Assessment. U.S. Global Change Research</p>					

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		Program, 842 pp. [Available online at http://nca2014.globalchange.gov]					
howard	feldman	<p>Section 1, page 25, lines 16-17. The report states that some climate change related "...health impacts are already underway in the United States". However there is insufficient description and evidence of those impacts, and for what specific changes in climate produced them, and without further documentation, the report cannot support this statement. The report by Melillo et al. 2014a is cited later in Section 1.1.1 (lines 30-31) as providing evidence that climate change is "...already disrupting people's lives and damaging some sectors of the U.S. economy" but disruption and economic damage are not health impacts per se, but rather potentially indirect impacts on health. The uncertainty associated with climate change will be large given the difficulty in distinguishing between man-made change and natural change. Those uncertainties would necessarily be carried forward to any attempt to link current climate change to current health impacts. The report does not adequately address these issues. This statement should more clearly define the current health impacts resulting from climate change and the limited nature of the science addressing those impacts.</p> <p>Reference</p> <p>Melillo, J. M., Terese (T.C.) Richmond, and G. W. Yohe, Eds., 2014a: Climate Change Impacts in the United States: The Third National Climate Assessment. U.S. Global Change Research Program, 842 pp. [Available online at http://nca2014.globalchange.gov]</p>	Ch 1: Preface and Introduction		25	16	This statement is a direct quote from the 2014 NCA3, Chapter 9, intended to help introduce the concept of health impacts of climate change in the introductory chapter. It is not based on economic impacts but on health impacts, as described in both the NCA3 Chapter 9 and the rest of this assessment. Uncertainty is described in sections 1.4.2 and 1.4.3, and in the technical support document (appendix) of this assessment. The final report also includes uncertainty descriptions in the front matter (guide to the report) and in each chapter's traceable accounts section. The authors believe the uncertainty in specific projections for specific health outcomes is adequately addressed in individual chapters devoted to those health outcomes. Therefore the text in this section has not been altered.
howard	feldman	The report provides useful definitions and differentiation between the concepts of climate and weather.	Ch 1: Preface and Introduction		25	32	We appreciate your positive comment.

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howard	feldman	The report indicates there are two ways in which climate change may affect human health (changes in severity or frequency of health problems and creating unprecedented or unanticipated health problems). There is no mention that changes in severity or frequency of health problems are not always in the direction of negative/adversity. For example, warming temperatures can reduce cold-related deaths. Further to this point, on page 29, lines 4-6, the authors discount those scenarios where the population's health or socioeconomic status is improving and turn this into a potential negative impact, rather than recognizing that there may also be positive benefits under this scenario. An evidence-based review should consider all aspects of impact, both adverse and beneficial, rather than a one-sided focus only on negative effects. The report should be systematically revised to fully explore benefits as well as negative effects.	Ch 1: Preface and Introduction		28	25	Benefits to health from climate change have been considered and are described where the literature supports such statements. Details of our process for considering literature has been added to the Front Matter and to the Appendix on Literature Search Process. We note that the extreme temperatures chapter does consider in detail the decline in mortality associated with reduced cold mortality. Therefore the text has not been altered here. The measures of health improvements, such as life expectancy, are of limited meaning in the context of the evaluation of risks due to a changing climate, which can occur via various pathways. The single metric of life expectancy does not convey or provide information on the risks associated with changes in climate and whether or not they are increasing, either in the past or in the future.
howard	feldman	A report by the Congressional Budget Office (CBO 2013) is cited regarding income equality and the projected continuing rise over the next 20 years. The USGCRP authors have not fully and appropriately characterized the CBO report in that, while the CBO's modeling predicts the historical pattern of rising earnings inequality to continue for the next two decades, earnings inequality is predicted to cease to rise by the mid-2030s. While the time frame for future trend predictions in medical conditions as described in Table 1 (page 32) is often undefined, there are projections extending out to the year 2050 for Alzheimer's disease and mental illness. Given the suggested impact of earnings inequality on disease trends, the predicted lack of rise after the mid-2030s does not appear to have been taken into account. Reference	Ch 1: Preface and Introduction		30	1	While there is a statement in the CBO report that refers to a lack of rise after the mid-2030s, there is no data shown or evidence to support that any modeling was performed for the years after 2035. The text has been revised to reflect that the rise in earnings inequality is expected to cease around 2035. The authors believe the information is still relevant and useful.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		CBO, 2013: Modeling Individual Earnings in CBO’s Long-term Microsimulation Model. Working Paper 2013-04. Government Printing Office, Washington, DC. [Available online at http://www.cbo.gov/sites/default/files/cbofiles/attachments/44306_CBOLT.pdf]					
howard	feldman	The report states that “population growth and migration in the United States may place more people at risk of the health impacts of climate change, especially as more people are located in and around vulnerable areas...” While this is true, it may also be true that if more people do not locate around these vulnerable areas, there may be no impact. The authors do not provide any data to support or refute either scenario.	Ch 1: Preface and Introduction		30	11	Text has been revised and references have been added.
howard	feldman	Similar one-sided speculative statements are made regarding “potential climate change related health impacts [that] may reduce the improvements that would otherwise be expected in some indicators of health status, and accentuate trends towards poorer health in other health indicators.” As before, the opposite of these predictions seems as plausible given the lack of any data to support or refute either scenario.	Ch 1: Preface and Introduction		30	26	The vulnerability to worsening of health status from climate change related exposures has been documented in previous assessments and are explored in more detail in the chapters after this introductory chapter. They are therefore not speculative or without data to support them. Citations have been added to the text to support this statement.
howard	feldman	Several population health statistics from the Centers for Disease Control (2014a) are presented regarding the “worsening” health status of the U.S. population (e.g., lifetime cancer diagnosis, increased obesity). These statistics are unadjusted for age and, thus, largely reflect the aging of the U.S. population. As such, the trends noted would be present regardless of whether or not climate change was occurring. While the authors note that these health disparities may “worsen” the impacts of climate change (page 34, lines 23-25), it is also possible that adaptive and mitigation measures will reduce such impacts. Reference	Ch 1: Preface and Introduction		31	2	Thank you for your comment. The description of health trends is not intended to imply any causality related to climate change, and this is not stated anywhere in the text. Rather, as stated, this information is provided as context describing trends in population attributes that have been associated in the scientific literature with increased vulnerability to climate change impacts. Therefore the text has not been altered.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		Melillo, J. M., Terese (T.C.) Richmond, and G. W. Yohe, Eds., 2014a: Climate Change Impacts in the United States: The Third National Climate Assessment. U.S. Global Change Research Program, 842 pp. [Available online at http://nca2014.globalchange.gov					
howard	feldman	The general equation presented at top of page 35 to describe the general approach to health modeling is useful. Additionally, the discussion on page 35, lines 17-34 regarding the challenges in characterizing certain exposures is informative. However, the report provides insufficient details to fully understand the quantitative health modeling conducted.	Ch 1: Preface and Introduction		35		Thank you for your positive comments. Because of the complexity of health modeling, it was not considered advisable to provide full details of methods of all modeling studies in the introductory chapter. The report summarizes published literature only, so no studies are unique to this report. More complete details about the methods of any particular modeling study can be found in the methods section of the publication. A general description of the methods used in the research highlights can be found in the technical support document (appendix), but the commenter should again reference the methods section of the underlying publication for detailed methods descriptions.
howard	feldman	The report is selective in its use of supporting literature for some/most key findings. The authors seemingly have chosen the cited literature because it supports an a priori 'finding' rather than deriving a finding from a systematic review of the literature. Also, assumptions are made regarding the weather-related events (e.g., higher frequency of extreme heat waves) Projected to precipitate health outcomes. In most situations, the degree of confidence in these assumptions is not stated. For precipitating weather scenarios that are themselves of low or unknown confidence, ascribing high certainty to the subsequent health event predictions is not justified.	Ch 2: Temperature-Related Impacts				The author team has determined that there is high confidence in projections of increasing heat waves. The report assessed the body of literature, and the process of doing so has been described. No change has been made to the text.
Deirdre	Mason	The Association of State Drinking Water Administrators (ASDWA) is the professional association serving state drinking water program administrators in the 50 states, territories, the Navajo Nation, and the District of Columbia. The association was formed in 1984 to support states in their efforts to protect public health through the provision of safe drinking water.					While the Extreme Events chapter does discuss potential drought-related health impacts in general, we focused on broad trends rather than delving too deeply or providing such a level of specificity as requested by the commenter. The amount of literature that specifically cites health impacts associated with climate-related

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>Overarching Comments: ASDWA appreciates the opportunity to provide comments on the “Draft Impacts of Climate Change on Human Health in the United States” and commends the USGCRP on its development. The document appears to provide a comprehensive review of climate change impacts on human health. The document uses a practical approach to examine available information from scientific studies and make sensible conclusions using varying degrees of confidence that are consistent with our knowledge of drinking water issues. We also commend the inclusion of harmful algal toxin stressors and impacts to drinking water in the document. In addition, ASDWA offers the following more specific comments pertaining to drinking water for your consideration.</p> <p>Chapter 5, Climate Impacts on Water-Related Illness</p> <ul style="list-style-type: none"> • Add Information on Drought Impacts to Drinking Water: Chapter 5 of the document includes information about climate change impacts on human exposure to water-related illness and water quantity and quality in three key finding areas: waterborne illness; exposure from extreme precipitation events; and water infrastructure damage or failure. While these topics seem to be assessed adequately, ASDWA recommends that additional information be included here about health risks from drought impacts on drinking water. Drought issues could either be captured by adding a fourth “key finding,” or be added into the text under one or more of the existing three key findings in this chapter. As a start, the information about drought impacts on drinking water provided in Chapter 7.6 (page 261, line 19-32) and some of the information about mental health and well-being provided in Chapter 8 (regarding lack of water availability and access to safe drinking water) could be added to the drinking water section here (Chapter 5.4.1). Following are the drinking water specific topics related to drought and health that we believe warrant further 					<p>changes to drought in the U.S. is sparse and still emerging. Because of the lack of consensus in the literature, drought was not included as a key finding in either the Extreme Events or Water-Related Illness chapters. To the extent that space allows within our page limits, we have revised the text in the Water-Related Illness chapter in some places to better reflect the body of literature available within the US for health impacts related to water quantity and quality (including saltwater intrusion, water reuse issues, and drinking water treatment effects). The assessment does not include detailed discussions of climate mitigation, adaptation, or economic valuation. Consideration of human adaptive capacity has been included as appropriate to assess projected climate impacts on human health.</p> <p>While the Extreme Events chapter does discuss potential drought-related health impacts in general, we focused on broad trends rather than delving too deeply or providing such a level of specificity as requested by the commenter. The amount of literature that specifically cites health impacts associated with climate-related changes to drought in the U.S. is sparse and still emerging. Because of the lack of consensus in the literature, drought was not included as a key finding in either the chapter on Water-Related Illness or Extreme Events. Regarding impacts of wildfires on drinking water, we have revised the text to include this suggestion.</p>

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>discussion and assessment in the document:</p> <ul style="list-style-type: none"> o Increased concentrations of contaminants from low water levels (e.g., arsenic -- this is briefly mentioned on page 225 in relation to irrigation water); o Additional infrastructure needs and the associated cost burden for communities and households; o Physical and mental health risks caused by low water levels and having no access to potable water; o Source water safety, protection, and sustainability; o Competition with agriculture to simultaneously maintain safe drinking water and food production; o Saltwater intrusion; o Water reuse and recycling; o Severe economic and monetary effects; and o Personal hygiene and lifestyle changes from water conservation. <p>• Add potential impacts of warmer temperatures on drinking water treatment and costs: These impacts can be manifested in several ways. Warmer temperatures typically encourage more microbiological growth in water treatment plants, storage tanks, and distribution systems. These challenges, in turn, may require greater than normal levels of disinfectant addition. Greater quantities of added disinfectant can exacerbate the challenge of dealing with disinfection by-products. Another possible manifestation of elevated temperatures is promotion of harmful algal blooms (HABs) and their release of associated cyanotoxins. Water treatment facilities that rely on sources of drinking water threatened by HABs must then expend additional resources (e.g., addition of activated carbon to adsorb cyanotoxins) to address this</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>challenge. While Chapter 5 does acknowledge inadequate and additional stresses on treatment capacity on page 169, specific issues, of the type described above, are not specifically addressed.</p> <p>o Page 169: ASDWA recommends that the discussion on page 169 be expanded to include increased treatment needs and the associated cost burden for communities and households that result from climate variance in general and from harmful algal blooms, in particular.</p> <p>o Page 169, line 7-8 and 182, line 24-46 (description of evidence base): ASDWA recommends that the discussions on these pages be expanded to include potential health impacts from disinfection by-product formation during drinking water treatment processes due to water quality changes from climate variance as follows:</p> <p>♣ "Studies have shown several disinfection byproducts to be carcinogenic in laboratory animals (e.g., including bromate, certain trihalomethanes and haloacetic acids). Some disinfection byproducts have also been shown to cause adverse reproductive or developmental effects in laboratory animals (e.g., chlorite and certain trihalomethanes and haloacetic acids)." From EPA's website.</p> <p>♣ There is increased potential for human exposure to harmful levels of cyanotoxins when the source water for a treatment facility is inundated with harmful algal blooms.</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>Chapter 7.7, Wildfires</p> <ul style="list-style-type: none"> • Add impacts to drinking water from wildfires: While Chapter 7.7 of the document includes mention that “post-wildfire erosion and runoff has been linked to increased flooding and debris flow hazards,” there is no mention of drinking water specific impacts. <p>o Page 265, line 24-26: ASDWA recommends that this discussion be expanded to include impacts on drinking water quality and quantity from sediment and debris, such as the additional treatment needs and costs, and potential loss of supply.</p> <p>Thank you for the opportunity to provide comments. If you have any questions, please contact Jim Taft at jtaft@asdwa.org or 703-812-9507.</p>					
Sebnem	Dugmeoglu	<p>Hello,</p> <p>I am a student at Drexel University, I am taking a class on environmental health and in the class we were assigned this reading. While reading this report I learned a lot about the adverse effects of environmental changes and disasters. This specific chapter on mental health was especially interesting to me. I focused on the reading about extreme heat and how it would increase aggression in people. In class we did a design project where we talked about the different ways to design infrastructure so that it does not hurt the environment and/or designs that would protect against some harsh aspects of the environment. For example we talked about the Asthma friendly homes that provided above average air quality for people who suffer from Asthma or similar conditions. I think this report would be a great way to capture the attention of people who would potentially be designing homes or living spaces with those with mental disorders to make</p>	Ch 8: Mental Health		299	15	<p>Thank you for your thoughtful comment and feedback, however policy issues are beyond the defined scope of the Climate and Health Assessment, a scientific document that provides the basis for decision making, but does not address policy. We appreciate that you found the report motivating and relevant to your interests.</p>

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>sure that they are focused on protecting its inhabitant from intense heat exposure. From the numbers in your report it seems that the heat can really have an affect on people who are already affected by these conditions everyday and I think that instead of letting these terrible things, like increased aggression and death, happen to them we should use the precautionary principle and design our infrastructure to protect against the imminent rise in temperature. Because those with mental disabilities are part of a vulnerable population I believe that these measures would be important Environmental Justice and Equality steps to take as well. Your report does a great job of providing an overview of what can go wrong if we do not take this route. Unfortunately, because most of the funding used for health and environmental health measures follow the bio medical model of funding I know that these design implementations might be a long stretch. If we can not come together as a nation to slow down or stop the coming environmental disasters like this deadly increase in temperature than I think that we really need to start working with engineers, scientists, policy makers, health professionals, and social scientists alike to work on ways to alleviate some of the adverse effects that are bound to destroy communities with these extreme exposures. Ultimately, we need to start taking action and this report is a great step in letting the nation and world know that all the dangers associated with our poor treatment of the environment and ecosystems are very serious and we need to start paying much more attention to them.</p> <p>Thank you,</p> <p>Sebnem Dugmeoglu</p>					
Ami	Gadhia	<p>AAP Headquarters 141 Northwest Point Blvd Elk Grove Village, IL 60007-1019 Phone: 847/434-4000</p>					<p>In regards to comments on Climate Change and Human Health chapter, text has been revised. In the table, the text has been revised and references provided in regards to childhood statistics on diabetes and obesity. Because there is limited support in the literature for US rates of childhood mental health and functional disabilities (as different from developmental</p>

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		<p>Fax: 847/434-8000</p> <p>E-mail: kidsdocs@aap.org</p> <p>www.aap.org</p> <p>Reply to</p> <p>Department of Federal Affairs</p> <p>Homer Building, Suite 400 N</p> <p>601 13th St NW</p> <p>Washington, DC 20005</p> <p>Phone: 202/347-8600</p> <p>Fax: 202/393-6137</p> <p>E-mail: kids1st@aap.org</p> <p>Executive Committee</p> <p>President</p> <p>Sandra G. Hassink, MD, FAAP</p> <p>President-Elect</p> <p>Benard P. Dreyer, MD, FAAP</p> <p>Immediate Past President</p> <p>James M. Perrin, MD, FAAP</p> <p>Executive Director/CEO</p> <p>Errol R. Alden, MD, FAAP</p>					<p>disabilities), the authors do not find it appropriate to add these topics to this summary table. More information on children's health and vulnerability can be found in the chapter on Populations of Concern.</p> <p>In regards to comments on the Temperature-Related Death and Illness chapter, we greatly appreciate your feedback.</p> <p>In regards to comments on the Air Quality Impacts chapter, Section 3.6 summarizes the populations of concern, including children. We believe that this section clearly and accurately describes the role of age in contributing to vulnerability.</p> <p>In regards to comments on the Vectorborne Disease chapter, we agree with this concern; the chapter discusses this in the Population of Concern section.</p> <p>In regards to comments on the Water-Related Illness chapter, thank you for your comment; however this citation is already included in section 5.4.1</p> <p>In regards to comments on the Food Safety, Nutrition, and Distribution chapter, correlation between ambient temperature and foodborne illness is covered in this chapter in the section on pathogens. As pointed out by the commenter, the basis for greater vulnerability of children to nutrition is not completely known; the author team has attempted to elucidate the issue of body weight and development, and has added additional vulnerabilities in children in the section on populations of concern for this chapter.</p>

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		Board of Directors District I Carole E. Allen, MD, FAAP Arlington, MA District II Danielle Laraque, MD, FAAP Brooklyn, NY District III David I. Bromberg, MD, FAAP Frederick, MD District IV Jane M. Foy, MD, FAAP Winston Salem, NC District V Richard H. Tuck, MD, FAAP Zanesville, OH District VI Pamela K. Shaw, MD, FAAP Kansas City, KS District VII					<p>Additional information on children can be found in Populations of Concern</p> <p>In regards to comments on the Extreme Events chapter, correlation between ambient temperature and foodborne illness is covered in this chapter in the section on pathogens. As pointed out by the commenter, the basis for greater vulnerability of children to nutrition is not completely known; the author team has attempted to elucidate the issue of body weight and development, and has added additional vulnerabilities in children in the section on populations of concern for this chapter. Additional information on children can be found in Populations of Concern</p> <p>In regards to comments on the Mental Health and Well-Being chapter, we appreciate the comment for Page 295, lines 11-12 and pages 303-304. The assessment does not include detailed discussions of climate mitigation, adaptation, or economic valuation. Consideration of greenhouse gas emissions pathways and human adaptive capacity has been included as appropriate to assess projected climate impacts on human health. Page 297, line 33: We appreciate the suggestion but we have not chosen to include the citation. Page 299, lines 22-26: We appreciate your comment however due to page limits for the chapter and scope we are unable to delve into greater details but refer you to the article cited for those specific details.</p> <p>In regards to comments on the Populations of Concern chapter, we believe that we have addressed this topic. We have, however, revised the text to include greater detail regarding the convergence of non-climate</p>

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		<p>Anthony D. Johnson, MD, FAAP Little Rock, AR District VIII</p> <p>Kyle Yasuda, MD, FAAP Seattle, WA District IX</p> <p>Stuart A. Cohen, MD, MPH, FAAP San Diego, CA District X</p> <p>Sara H. Goza, MD, FAAP Fayetteville, GA June 8, 2015</p> <p>Dr. Chris Weaver Executive Director (Acting) U.S. Global Change Research Program 1717 Pennsylvania Ave, NW, Suite 250 Washington, D.C. 20006 USA</p> <p>Dear Dr. Weaver:</p>					<p>stressors, such as age and economic status. We refer those interested in a deeper treatment of the topic to review the associated citations. As we have noted throughout this chapter, the impact of poverty on children’s (and other vulnerable populations’) health is a critical factor to consider when characterizing the health impacts of climate change.</p>

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		<p>On behalf of the American Academy of Pediatrics (AAP), a non-profit professional organization of 64,000 primary care pediatricians, pediatric medical sub-specialists, and pediatric surgical specialists dedicated to the health, safety and well-being of infants, children, adolescents, and young adults, I appreciate the opportunity to provide comments regarding the U.S. Global Change Research Program's (GCRP) draft report, The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment. The AAP commends the GCRP's recognition of children as a population that is uniquely vulnerable to the effects of global climate change. We urge the GCRP to incorporate the health impacts on children into all of the statistics and analysis that underlie its recommendations.</p> <p>Because of their physical, physiologic, and cognitive immaturity, children are often more vulnerable to adverse health effects from environmental hazards compared with adults. As the climate changes, some existing environmental hazards will worsen and other new ones will emerge. Anticipated direct health consequences from climate change include increased morbidity and mortality from extreme weather events and weather disasters, higher rates of climate-sensitive infectious diseases, more air pollution-related disease and premature mortality, and more cases of heat stroke and heat-related death.</p> <p>Additional effects of climate change, with profound implications for the health and welfare of future generations of children, are anticipated. Food availability could be reduced as land and ocean food productivity patterns shift and species diversity declines. Water availability will change and become too abundant in some regions (flooding) and much reduced in others (drought). Coastal populations will be forced to move because of the rising sea level. Large-scale, forced migrations are conceivable, driven by abrupt</p>					

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		<p>climate change, natural disaster, or political instability over resource availability.</p> <p>Government at all levels, from the smallest municipalities to the national and international levels, should implement aggressive policies to halt man-made contributions to climate change and to mitigate its impact on children's health. Specifically, policymakers must do the following:</p> <ol style="list-style-type: none"> 1. Develop aggressive, long-term policies to reduce the major contributing factors to global climate change. 2. Invest in prudent and vital preparations for our public health care systems, including immunization programs and disease surveillance, reporting, and tracking. 3. Give specific attention to the needs of children in emergency management and disaster response. 4. Support education and public awareness of the threats from climate change and their implications for public and children's health now and in the future. 5. Fund interdisciplinary research to develop, implement, and measure outcomes of innovative strategies to both mitigate and adapt to climate change, particularly in areas with direct implications for children's health. <p>Below, we provide chapter-by-chapter suggestions for specific changes to the text within the draft report.</p> <p>Chapter 1: Climate Change and Human Health</p> <ul style="list-style-type: none"> • Page 31, lines 2-7: These points go over the health trends related to the presence of chronic disease, ill health, and disease risk. Each point addresses various age ranges (“older than 65”, and “over the 					

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		<p>age of 20”) but excludes children, i.e., those under the age of 20. We strongly encourage the GCRP to include a statistic on children’s health in this section. For example: nearly 10 percent of children in the U.S. have asthma. Asthma is also associated with obesity, another chronic health problem with significant consequences for children.</p> <ul style="list-style-type: none"> • Pages 32-33, Table 1, “Current estimates and future trends in chronic medical conditions that interact with the health risk associated with climate change.” Within this table, we would urge you to include statistics regarding the prevalence of these illnesses (where applicable) within the child population where notable. For example, with regards to mental illness, mental and emotional distress documented in children and adolescents after weather disasters include post-traumatic stress disorder and high rates of sleep disturbance, aggressive behavior, sadness, and substance use or abuse. Some studies suggest that children have more persistent symptoms than adults who experience the same disaster, but further studies specific to children’s experience are required. <p>Chapter 2: Temperature-Related Death and Illness</p> <ul style="list-style-type: none"> • On page 60, the draft report states that “The U.S. population has become less sensitive to heat due to a combination of how many homes and businesses have air conditioning...”. We urge the GCRP to investigate and consider how many schools – where children and their teachers spend much of their day – do not have air conditioning. Infants under one year of age may also be at particularly elevated risk to heat-related illness. <p>Chapter 3: Air Quality Impacts</p>					

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		<ul style="list-style-type: none"> • Page 89, lines 33-37: Air pollutants like smog and ozone will have a greater impact on a child than on an adult not only due to their smaller size, but because of the nature of their growing bodies and minds. A bad air day exacerbates allergies and asthma, can impair lung function in children, and limits children's access to healthy outdoor physical activity. The health impacts of air pollutants may be lifelong, with exposure starting in utero and causing multi-system damage, including on the developing brain. We therefore urge the GCRP to include information regarding ground level ozone and the effects of both prenatal and postnatal exposure on children's health. • Page 95, lines 13-21: We urge the GCRP to include references to the impact of air quality on allergic disease in children. For example, in many locales, with later first frost and earlier spring thaw due to climate change, the allergy season has become longer and more severe, and that impacts children's health in myriad ways. • Page 97, lines 26-29: In addition to referencing sensitivity among the elderly to short term ozone exposure, we also encourage the GCRP to include children's sensitivity. • Page 99, lines 27-30: This section references that African American, women, and the elderly experience the greatest baseline risk from air pollution, and then notes that children (among others) are more vulnerable to indoor air pollution. However, children are at greatest risk for both indoor and outdoor air pollution, and thus lines 27-30 should be revised to include children within the list of populations at risk from outdoor air pollution. <p>Chapter 4: Vectorborne Diseases</p>					

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		<ul style="list-style-type: none"> <li>• A general comment for the chapter: We urge the GCRP to incorporate children’s additional risk for Lyme disease given their increased time outdoors and the difficulty of identifying and removing ticks from young children. Of note, page 136, lines 37-38 references that Lyme disease is most common in children ages 5-9, and the CDC data also shows that between 2000 and 2010, reported cases of Lyme disease were most common among boys in that age range. <p>Chapter 5: Climate Impacts on Water-Related Illness</p> <ul style="list-style-type: none"> <li>• A general comment and an additional citation for consideration by the GCRP: Water-borne disease outbreaks in the United States exhibit a positive correlation with excess precipitation events, which are likely to increase with climate change; over a 45-year period, 68% of water-borne illness outbreaks have been associated with precipitation above the 80th percentile. <p>Chapter 6: Food Safety, Nutrition, and Distribution</p> <ul style="list-style-type: none"> <li>• A general comment and additional citations for consideration by the GCRP: Foodborne illness correlates positively with ambient temperature and is also likely to increase as the climate warms. <li>• Page 224, line 21: We recommend that the GCRP elaborate on the point that children may be especially vulnerable to foodborne illness. It is not completely clear why children are more susceptible to food borne illnesses, but may in part be due to lack of any 					

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		<p>preexisting antibody. Also, young children and immune compromised children have poor ability to fight off these infections. The majority of most food borne illnesses in children, occur in those under 5 years of age. In thinking about this, there are 75 million children under 18 in the U.S. and 25 million 5 years of age or under.</p> <ul style="list-style-type: none"> • We appreciate the GCRP draft report’s discussion of the impact of increased carbon dioxide on crop content of protein and essential nutrients (including iron). Children are the highest risk group to iron deficiency, and are vulnerable to permanent neurocognitive deficits due to iron deficiency and to generalized systemic effects such as stunting due to general under-nutrition. Thus they are at particularly elevated risk from the impacts of climate change on the nutritive value of foods. <p>Chapter 7: Impacts of Extreme Events on Human Health</p> <ul style="list-style-type: none"> • Page 254, Section 7.3 (“Complex Factors Determine Health Impacts”): This section discusses three elements that factor into vulnerability of individuals to climate change – exposure, sensitivity, and adaptive capacity. As noted above, because of their physical, physiologic, and cognitive immaturity, children are among those often most vulnerable to adverse health effects from environmental hazards. They may be more likely to be exposed, given the time they spend outdoors; they may be more sensitive, given their physiology; and they may have lower adaptive capacity. Children also have longer life spans over which the adverse impacts of environmental hazards must play out. We therefore urge the GCRP to further elaborate on the unique position that children occupy – along with other sensitive populations noted in the document – when attempting to mitigate the health impacts of climate change. • We also urge the GCRP to consider the impact that natural disasters can have on children in the form of producing toxic 					

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		<p>stress. Toxic stress results when there is strong, excessive, and/or prolonged adversity that occurs in childhood without the buffer of stable, supportive relationships with caring adults. Toxic stress can be caused by many factors including natural disasters.</p> <p>Chapter 8</p> <ul style="list-style-type: none"> • Page 295, lines 11-12 and pages 303-304: We appreciate the recognition that children and pregnant women are especially vulnerable to adverse mental health outcomes due to climate change. It is worth noting, however, that community support services and early therapeutic intervention and post-disaster counseling can significantly reduce the medium- and long-term mental health burden on children. This capacity is critical to cultivate, as the availability of already limited mental health services shrinks as needs increase following natural disasters. • Experiences with Hurricane Katrina demonstrated the difficulties with tracking children's whereabouts, keeping children and caregivers together, and special needs of hospitalized infants and children during and after major natural disasters. We urge the GCRP to recognize these specific interventions necessary to help children and pregnant/postpartum women recover during climate-related disasters. We also recommend inclusion of disaster preparedness resources for children. • Page 297, line 33: We recommend that this section include data on or information about high-risk coping behaviors of children due to extreme weather events. See, e.g., Jyotsana Shukla, "Extreme Weather Events and Mental Health: Tackling the Psychosocial Challenge," <i>ISRN Public Health</i>, vol. 2013, Article ID 127365, 7 pages, 2013. • Page 299, lines 22-26: This section references six case-control studies involving 1,065 heat wave-related deaths, in which pre-existing mental illness was found to triple the risk of death due to 					

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		<p>heat wave exposure (Bouchama et al. 2007). It also refers to a 2012 study by Page et al. that found that the risk of death also increases during hot weather for patients with psychosis, dementia, and substance misuse. As it is not clear from the text of the chapter, we recommend that the GCRP include here a breakdown of the demographics (age groups, etc.) of the studies referenced.</p> <p>Chapter 9: Health Risk Factors and Populations of Concern</p> <ul style="list-style-type: none"> • Page 345, lines 31-38 and page 346, lines 1-3: We would encourage the GCRP to include more information here on heat-related physical exertion in all children, not just those participating in sports. • The impact of poverty on children’s health is also a critical factor to consider in ascertaining the impact of climate change on children’s health. As of 2012, in the United States, 22% of all children under 18 lived in poverty (16 million children), and 45% of all children under 18 lived in low-income households (32.7 million children). Families in poor and low-income households have difficulty accessing health care and meeting the basic needs that are crucial for healthy child development. This, in turn, negatively affects children’s resiliency from the physical and mental effects of climate change. In addition, children in poverty are less likely to have access to air conditioning to mitigate the effects of extreme heat. Children in poverty are also less likely to have capacity to respond to or escape from severe weather events. We urge the GCRP to elaborate on the additional burdens faced by poor children that are initially indicated on page 304 in the discussion of the “economically disadvantaged.” 					

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		<p>Conclusion</p> <p>Thank you again for the opportunity to provide input on the U.S. GCRP’s draft report. We greatly appreciate the GCRP’s efforts to recognize the unique disadvantages that children face with regards to the health impacts of climate change. If you have any questions, please do not hesitate to contact Ami Gadhia in our Washington, D.C. office at 202/347-8600 or agadhia@aap.org.</p> <p>Sincerely,</p> <p>Sandra G. Hassink, MD, FAAP</p> <p>President</p> <p>SGH/avg</p> <p>Bunyavanich S, Landrigan CP, McMichael AJ, Epstein PR. The impact of climate change on child health. <i>Ambul Pediatr.</i> 2003;3(1):44-52.</p> <p>Slingo JM, Challinor AJ, Hoskins BJ, Wheeler TR. Introduction: food crops in a changing climate. <i>Philos Trans R Soc Lond B Biol Sci.</i>2005;360 :1983– 1989.</p> <p>United Nations Environment Programme. Potential impacts of climate change: fresh water stress—current population at risk. Available at: www.grida.no/climate/vital/38.htm.</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>McMichael A, Githek OA. Human health. In: McCarthy JT, Canziani OF, Leary NA, Dokken DJ, White KS, eds. Climate Change 2001: Impacts, Adaptations, and Vulnerability. Geneva, Switzerland: Intergovernmental Panel on Climate Change; 2001:453– 485. Available at: www.grida.no/climate/ipcc_tar/wg2/pdf/wg2TARchap9.pdf.</p> <p>Ibid and US Department of Health and Human Services, Agency for Healthcare Research and Quality. Pediatric terrorism and disaster preparedness: a resource guide for pediatricians. Available at: www.ahrq.gov/research/pedprep/resource.htm.</p> <p>U.S. Environmental Protection Agency (2013). Respiratory Diseases. Accessed on May 31 at http://www.epa.gov/ace/health/resp_diseases.html</p> <p>Chest. 2015 Mar 5. doi: 10.1378/chest.14-2689), (JACI 2015doi:10.1016/j.jaci)2015.01.010</p> <p>Bunyavanich S, Landrigan CP, McMichael AJ, Epstein PR. The impact of climate change on child health. <i>Ambul Pediatr.</i> 2003;3(1):44-52.</p> <p>Moore KW, Varela RE. Correlates of long-term posttraumatic stress symptoms in children following Hurricane Katrina. <i>Child Psychiatry Hum Dev.</i> 2010;41(2):239-250. Accessed 20100208. http://dx.doi.org/10.1007/s10578-009-0165-6. See also McLaughlin KA, Fairbank JA, Gruber MJ, et al. Trends in serious emotional disturbance among youths exposed to Hurricane Katrina. <i>J Am Acad Child Adolesc Psychiatry.</i> 2010;49(10):990-1000. Accessed 20100921. http://dx.doi.org/10.1016/j.jaac.2010.06.012.</p> <p>Xu Z, Etzel RA, Su H, Huang C, Guo Y, Tong S. Impact of ambient temperature on children's health: A systematic review. <i>Environ Res.</i> 2012;117:120-131. Accessed 20120813. http://dx.doi.org/10.1016/j.envres.2012.07.002. See also Basagana X, Sartini C, Barrera-Gomez J, et al. Heat waves and cause-specific mortality at all ages. <i>Epidemiology.</i> 2011;22(6):765-772.</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>Accessed 20111004. http://dx.doi.org/10.1097/EDE.0b013e31823031c5. See also Basu R, Ostro BD. A multicounty analysis identifying the populations vulnerable to mortality associated with high ambient temperature in California. <i>Am J Epidemiol.</i> 2008;168(6):632-637. Accessed 20080908. http://dx.doi.org/10.1093/aje/kwn170. See also Deschenes O, Greenstone M. Climate change, mortality, and adaptation: Evidence from annual fluctuations in weather in the US. . 2007;NBER Working Paper No. 13178(4). Accessed 9/22/2014.</p> <p>JAMA Psych 2015; doi: 10.1001/jamapsychiatry</p> <p>See http://www.epa.gov/groundlevelozone/health.html and http://epa.gov/airquality/ozonepollution/pdfs/safety.pdf.</p> <p>Ibid.</p> <p>Children are especially vulnerable to both short-term illness and long-term damage from ambient air pollution, because their lungs are developing and growing, they breathe at a higher rate than adults, and they spend more time outdoors engaging in vigorous physical activity. See <i>Global Climate Change and Children's Health</i>. Available at: http://pediatrics.aappublications.org/content/120/5/e1359.full.</p> <p>http://www.cdc.gov/lyme/stats/chartstables/incidencebyagesex.html.</p> <p>Curriero FC, Patz JA, Rose JB, Lele S. The association between extreme precipitation and waterborne disease outbreaks in the United States, 1948–1994. <i>Am J Public Health.</i>2001;91 :1194–1199.</p> <p>Rose JB, Epstein PR, Lipp EK, Sherman BH, Sernard SM, Patz JA. Climate variability and change in the United States: potential impacts on water- and foodborne diseases caused by microbiologic agents. <i>Environ Health Perspect.</i>2001;109 (suppl 2) :211– 220. See also: Kovats RS, Edwards SJ, Hajat S, Armstrong BG, Ebi KL, Menne B. The effect of temperature on food poisoning: a time-</p>					

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		<p>series analysis of salmonellosis in ten European countries. Epidemiol Infect.2004;132 :443– 453 and Fleury M, Charron DF, Holt JD, Allen OB, Maarouf AR. A time series analysis of the relationship of ambient temperature and common bacterial enteric infections in two Canadian provinces. Int J Biometeorol.2006;50 :385– 391.</p> <p>For example, rates of Vibrio have increased in the United States btw 1996-2010. See Newton et al, Clin Infect Dis, 2012.</p> <p>Elaine Scallan et al., “Estimates of Illnesses, Hospitalizations and Deaths Caused by Major Bacterial Enteric Pathogens in Young Children in the United States,” The Pediatric Infectious Disease Journal 32 (2013):217-221; and Kathleen M. Koehler, et al., “Population-Based Incidence of Infection With Selected Bacterial Enteric Pathogens in Children Younger Than Five Years of Age 1996-1998,” The Pediatric Infectious Disease Journal 25 (2006):129-134.</p> <p>Forum on Child and Family Statistics (2012). ChildStats.gov. Accessed on June 1 via http://www.childstats.gov/americaschildren/tables/pop1.asp</p> <p>Etzel RA, Balk SJ, eds. Pediatric Environmental Health. 2nd ed. Elk Grove Village, IL: American Academy of Pediatrics; 2003.</p> <p>See also National Commission on Children and Disasters, ed. 2010 Report to the President and Congress. http://archive.ahrq.gov/prep/nccdreport/nccdreport.pdf.</p> <p>https://www.aap.org/en-us/advocacy-and-policy/federal-advocacy/Documents/TSSOnePager.pdf.</p> <p>http://developingchild.harvard.edu/key_concepts/toxic_stress_response/.</p> <p>Kostelny K, Wessells M. Psychological aid to children after the 26 Dec tsunami. Lancet.2005;366 :2066– 2067.</p> <p>Wolmer L, Laor N, Dedeoglu S, Siev J, Yazgan Y. Teacher-</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>mediated intervention after disaster: a controlled three-year follow-up of children's functioning. J Child Psychol Psychiatry.2005;46 :1161– 1168. See also Goenjian AK, Walling D, Steinberg AM, Karayan I, Najarian LM, Pynoos R. A prospective study of posttraumatic stress and depressive reactions among treated and untreated adolescents 5 years after a catastrophic disaster. Am J Psychiatry.2005;162 :2302– 2308.</p> <p>Johnston C, Redlener I, eds. Hurricane Katrina, children, and pediatric heroes: hands-on stories by and of our colleagues helping families during the most costly natural disaster in US history. Pediatrics. 2006;117(suppl 2):S355–S460.</p> <p>See 1) Hospital –PICU availability – Pediatrics 2005; and 2) Disruption of the education process for children: ‘ 15,000 did not attend school in 2006-2007’ (Save The Children. Hurricane Katrina 2010)</p> <p>AAP Agenda for Children Strategic Plan Poverty and Child Health, https://www.aap.org/en-us/about-the-aap/aap-facts/AAP-Agenda-for-Children-Strategic-Plan/pages/AAP-Agenda-for-Children-Strategic-Plan-Poverty-Child-Health.aspx</p>					
howard	feldman	<p>Key Finding #1</p> <p>Future climate warming could lead to thousands to tens of thousands of additional deaths each year from heat in the summer, as calculated by extrapolating statistical relationships and without considering potential adaptive changes. [Very Likely, High Confidence]</p> <p>Comments</p> <p>The qualifying phrase “without considering potential adaptive changes” literally stands between the plausible/eventual scenario and a perceived world in which humans lack the capacity for ‘natural’ physiological adaptive responses and additionally lack the desire or knowledge to alter their behavior or environment in such a way that mitigates the effects of heat (or any environmental stressor). In short, this statement assumes that people have done</p>	Ch 2: Temperature-Related Impacts		51	5	<p>The existing text discusses adaptation at length, and the authors determined that the discussion is appropriate given the state of the literature.</p> <p>No change has been made to the text.</p>

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		<p>little to mitigate the effects of heat and, moreover, they will continue to fail in this regard.</p> <p>Overall, there is strong evidence that populations can acclimatize to warmer climates via a range of behavioral, physiological, and technological adaptations. Modern man has benefited from various adaptive interventions that have mitigated the effects of various environmental stressors, most of which presented a far greater public health risk than weather. Systematically removing this factor from climate-health considerations is analogous to disregarding decades of adaptations when exploring reasons for the dramatically increased life expectancy during the 20th Century. Since 1900, the average lifespan of persons in the United States has lengthened by greater than 30 years; 25 years of this gain are attributable to advances in public health such as vaccination, control of infectious diseases, enhanced sanitation, food safety, chlorination of drinking water, and medical advancements. (1) This shows the extent to which humans have been responding—and will likely continue to respond—behaviorally and technologically to mitigate material threats to their life and health. While air conditioning is not considered to be a public health countermeasure per se, that too has undoubtedly contributed to the increase in life expectancy.</p> <p>Air conditioning is undoubtedly the most successful and wide-scale technical adaptation to the effects of heat. Except in the temperate climate regions along the West coast, air conditioners (AC) are now standard equipment in most U.S. homes (2). As recently as 1993, only 68% of all occupied housing units had AC. The latest results from the 2009 Residential Energy Consumption Survey show that 87 percent of U.S. households are now equipped with AC. (2) This growth occurred among all housing types and in every Census region. Wider use has coincided with much improved energy efficiency standards for AC equipment, a population shift to hotter and more humid regions, and a housing boom during which average housing sizes increased. (2) While</p>					

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		<p>difficult to quantify the ameliorating effects of the increased use of air conditioning in homes and buildings, studies have shed light on this topic. A case-control study (3) determined that access to air conditioning reduced heat stroke by 400 percent. A large cohort study (4) comparing households with and without central air conditioning in the early 1980s identified a 42% lower death rate for air conditioned households during hot months. Kalkstein (5) estimated the impact of air conditioning by comparing mortality trends on days with exceptionally high heat and humidity (air conditioning use would be maximum on such days) versus all other days. In New York City, an estimated 21% of heat-related mortality during 1964-1988 may have been avoided due to air conditioning use. A case-control study (6) determined that access to air conditioning in St. Louis and Kansas City reduced heat stroke by 400 percent. Davis et al (7) examined this issue in greater detail using data on air conditioner use from the Energy Information Agency (EIA) for several separate years from 1980 to 1997. They compared those values with annual excess heat-related mortality data. In all regions except one, the mortality decline from the 1980s to the 1990s was coupled with increased air conditioning penetration. (See Davis et al, Figure 4)</p> <p>Finally, on the physiological front, there is much evidence that adaptation to a major temperature change improves with length of exposure. Migrants from temperate conditions begin to be able to work at temperatures they initially found to be intolerably high, and the likelihood of heat stroke progressively diminishes. Acclimatization may continue to improve over considerable time, but most people appear to achieve most of their improvement over a 14-21 day period, depending on various aspects of lifestyle. Kalkstein and Davis (8) found that, generally, cities in the southern U.S. did not show summertime heat-related increases in mortality, presumably largely because their population became acclimatized to hot weather, with building architecture and air conditioning being additional possible factors. Deschenes and Greenstone (9) also observed that colder climate census regions (e.g., New England) experienced higher mortality from days in excess of 90 degrees than did regions with warmer climates (e.g., West South</p>					

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		<p>Central which includes Arkansas, Louisiana, Oklahoma, and Texas). Bobb et al (10) concluded that the US population has become more resilient to heat over time, falling from 51 heat-attributable deaths per each 10 degree (F) increase in temperature in 1987 to 19 deaths per each 10 degree temperature increase in 2005, and this decrease could not be solely attributed to increased prevalence of air conditioning.</p> <p>References</p> <p>(1) Bunker JP, Frazier HS, Mosteller F. Improving health: measuring effects of medical care. <i>Milbank Quarterly</i> 1994;72:225-58; CDC MMWR April 02, 1999 / 48(12);241-243</p> <p>(2) US Energy Information Agency. http://www.eia.gov/consumption/residential/reports/2009/air-conditioning.cfm, accessed 8 May 2015.</p> <p>(3) Kilbourne EM. Heat-related illness: current status of prevention efforts. <i>Am J Prev Med.</i> 2002 May;22(4):328-9</p> <p>(4) Rogot E, Sorlie PD, Backlund E. Air-conditioning and mortality in hot weather. <i>Am J Epidemiol.</i> 1992 Jul 1;136(1):106-16.</p> <p>(5) Kalkstein LS. Health and climate change. Direct impacts in cities. <i>Lancet.</i> 1993 Dec 4;342(8884):1397-9</p> <p>(6) Kilbourne EM, Choi K, Jones TS, Thacker SB. Risk factors for heatstroke. A case-control study. <i>JAMA.</i> 1982 Jun 25;247(24):3332-6.</p> <p>(7) Davis R, et al. (2003). Changing heat-related mortality in the United States. <i>Environ Health Perspect.</i> 111,1712-1718.</p> <p>(8) Kalkstein LS and Davis RE. Weather and human mortality: an evaluation of demographic and interregional responses in the United States. <i>Annals Assoc Amer Geog.</i> 79(1), 1989, pp. 44-64</p> <p>(9) Deschênes, O., and M. Greenstone, 2011: Climate change,</p>					

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		mortality, and adaptation: Evidence from annual fluctuations in weather in the US. American Economic Journal: Applied Economics, 3, 152-185 (10) Bobb, J. F., R. D. Peng, M. L. Bell, and F. Dominici, 2014: Heat-Related Mortality and Adaptation to Heat in the United States. Environmental Health Perspectives, 122, 811-816, 40					
Cristina	Mullin	"Respiratory Illness" should be included in the health outcomes section (e.g. mold & moisture related diseases such as sinusitis, asthma, and hypersensitivity pneumonitis).	Executive Summary	ES1	4		This figure has been revised and includes cardiopulmonary outcomes.
Vijay	Limaye	what about the effects of climate on biogenic emissions of ozone precursors?	Ch 3: Air Quality		91	20	We appreciate this suggestion, but space is limited. The author team has deliberated and agreed on the most important information to include.
Vijay	Limaye	this issue merits further explanation for the public, in that warmer weather favors the chemical reaction underlying ozone formation, and urban heat island are an area in which we might expect effect modification between temperature and ozone to be the greatest	Ch 3: Air Quality		92	13	We appreciate this suggestion, but space is limited. The author team has deliberated and agreed on the most important information and illustrations to include.
Vijay	Limaye	need further explanation of downscaling method— what it is/why it is needed?	Ch 3: Air Quality		92	27	Due to the size of the topic, and the page limit for the chapter, we focused on broad information rather than delving too deeply or providing such a level of specificity. A reference to Otte et al. (Journal of Climate, 2012) was added in lieu of adding that level of detail to the text.
Vijay	Limaye	no health results are discussed, despite BenMAP mention in the methods	Ch 3: Air Quality		92	34	The chapter reports quantitative estimates of ozone effects in the text box as well as section 3.3.1.
Vijay	Limaye	Health results referred to but no health results were presented	Ch 3: Air Quality		93	6	The chapter reports quantitative estimates of ozone effects in the text box as well as section 3.3.1.
Vijay	Limaye	worth mentioning that unlike ozone (a secondary pollutant), PM is both primarily emitted and formed secondarily in the atmosphere	Ch 3: Air Quality		93	25	After consideration of this point, we still feel the existing text is clear and accurate.
Vijay	Limaye	add “Chronic exposure to” before “PM smaller...” or clarify is this acute, chronic, or both	Ch 3: Air Quality		93	28	The text has been revised to incorporate this suggestion.
Vijay	Limaye	why is “carbonaceous” PM worthy of note?	Ch 3: Air Quality		94	17	The text has been revised to remove this term.

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Vijay	Limaye	this statement should include a citation	Ch 3: Air Quality		100	29	The text has been revised to incorporate this suggestion
Vijay	Limaye	should “were” be “are” given how the sentence begins?	Ch 3: Air Quality		100	34	We incorporated this edit.
Vijay	Limaye	is there any consensus on the direction of effect modification, for O3/temperature perhaps?	Ch 3: Air Quality		103	10	The direction of the effect will depend on whether temperature is increasing or decreasing. We believe the current text is both accurate and clear.
Cristina	Mullin	You may want to include here (or in the Water-Related Illnesses section on page 11) that indoor air quality can decline following severe flooding events due to increased moisture indoors from flooding which allows for the growth of mold and fungi. This can increase human exposure to harmful bioaerosols.	Executive Summary		7	1	Please see the chapter on air quality impacts (indoor air section) and the chapter on Extreme Events (fungal disease) for more specific information this topic.
howard	feldman	Key Finding #1 Supporting statement “Future climate warming could lead to tens of thousands of additional deaths from heat in the summer when not considering potential adaptation.” Comments The adaptation issue is addressed in our more generalized response. Ignoring the adaptation factor may make it possible, as an exercise in hypotheticals, to make such a statement. Given the absolute certainty of various forms of adaptive responses, the statement, however, is absurd. As a result, the statement should be removed.	Ch 2: Temperature-Related Impacts		51	5	The existing text discusses adaptation at length, and the authors determined that the discussion is appropriate given the state of the literature. No change has been made to the text.
howard	feldman	Key Finding #1 Supporting statement “Climate warming will also lead to a decrease in deaths from cold in the winter, but this reduction in deaths will be much smaller than the increase in heat deaths in most regions.”	Ch 2: Temperature-Related Impacts		51	7	The text for this Key Finding and subsequent discussion of the evidence in the Traceable Account has been considerably revised. These revisions, along with revisions to the body of the chapter as well, address a number of the new references noted in this comment including Gasparrini et al. and Saha et al. However, the general nature of this finding with respect to a net increase in future

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		<p>Comments</p> <p>The latest National Health Statistics Report (2013) (1) on this issue shows significantly higher death rates in the US related to cold (4.2 deaths per 106 people) than to heat (2.1 deaths per 106) during 2006-2010. Generally, this disparity persisted across all age groups and geographic regions. The West experienced, by far, the highest cold-related death rate, which suggests that acclimatization to extreme cold is exceedingly difficult even in an area accustomed to such temperatures. Given this difficulty and the extended lag period for health effects from extreme cold weather (discussed further below), confidence in the above statement seems lacking. Overall the number of annual deaths attributable to cold temperature is about 0.8% of annual deaths in the US. (2)</p> <p>The peer-reviewed literature is mixed on the relative contributions of heat and cold to mortality; however, several recent studies with high rigor indicate that cold temperatures generate more deaths than hot temperatures. Medina-Ramon and Schwartz (3) observed significant heterogeneity in the effect of extreme heat; its effects were modified by the types and extent of adaptations, population density, and climatological (not weather) differences. However, the effects of extreme cold were homogeneous across cities with different climates. This suggested to the authors that acclimatization to the “unusualness” of the cold temperatures is more difficult to achieve. Andersen and Bell (4) examined heat-related mortality, comparing 99th percentile temps with 90th percentile temps. The effects of cold were assessed by comparing 10th to the 1st percentile temps. A shorter lag was observed for heat-related mortality, along with a 3% mortality increase overall, but effects were exhausted at 7 days. A longer lag (up to 25 days) was observed for cold effects with a 4.2% increase in mortality overall. The study also reported significant spatial heterogeneity, particularly when using absolute temperature differences (vs relative differences). Most recently, Gasparinni et al (5) analyzed</p>					<p>temperature attributable deaths as a result of climate change remains unchanged as the author team determined that this is an accurate reflection of the state of the literature.</p>

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		<p>over 74 million deaths in 384 locations on all inhabited continents except for Africa, and determined that most of the temperature-related mortality burden was attributable to the contribution of cold (7.29%) vs heat (0.42%). The effect of temperature extremes was substantially less than that attributed to milder—but still cold—temperatures. This finding suggests that the gradual temperature increases associated with climate change, not acute weather-related events, will save millions of lives.</p> <p>Deschênes and Moretti (2) conducted a particularly robust analysis of extreme weather events, mortality, and migration. The authors found strong evidence of a large and statistically significant permanent effect on mortality associated with cold waves. By contrast, the study found that the increase in mortality due to heat waves is immediate and short-lived. Moreover, the authors conclude,</p> <p>“The increase in mortality that occurs in the days immediately following heat waves appears entirely driven by temporal displacement.”</p> <p>This temporal displacement is also known as forward mortality displacement and “harvesting”, in which deaths among the frail are merely accelerated by a few days, thus having no permanent effect on mortality rates. While some health scientists still feel that this issue is “an incompletely resolved problem” that needs additional methodological research (6), the majority of studies that examined displacement supported this phenomenon. A simple literature search on PubMed from 2008-2014—keywords: heat, mortality, displacement OR harvesting—returned 15 peer-reviewed original research articles that assessed mortality displacement. Of those, 12 found evidence of this phenomenon, e.g., (7) and (8).</p>					

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		<p>Deschênes and Moretti (2) also conducted a compelling in-depth analysis of the impact of migration on longevity in the US. Geographic mobility, a commonly overlooked determinant of longevity, accounts for 8%-15% of the total gain in life expectancy experienced by the US population over the past 30 years, (8.1 yrs for females; 6.3 yrs for males) according to the authors. In essence, this analysis of migration serves as a ‘natural experiment’ that suggests relocating to hot weather climates—and physiologically adapting to hotter weather—is beneficial relative to remaining in a cold climate region.</p> <p>In an exploration of the causal relation between mortality rates and fine particulate matter (PM2.5) in 100 US cities, Cox and colleagues (9) applied Granger causality tests. These investigators did not find a causal relation between those two factors, but instead observed clear evidence of a significant negative Granger-causal relation between temperature and mortality rates. More simply stated, warmer cities (and warmer months and days) tended to have lower mortality rates than colder ones.</p> <p>In summary, the certainty of this statement is low. At best, it deserves a “we don’t know”.</p> <p>References</p> <p>(1) Berko J, Ingram DD, Saha S, Parker JD. Deaths attributed to heat, cold, and other weather events in the United States, 2006-2010. Natl Health Stat Report. 2014 Jul 30;(76):1-15.</p> <p>(2) Deschênes O, Moretti E. Extreme weather events, mortality, and migration. Review of Economics and Statistics, November</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>2009, 91(4): 659-681 Medina-Ramón M, Schwartz J. Temperature, temperature extremes, and mortality: a study of acclimatization and effect modification in 50 US cities. <i>Occup Environ Med.</i> 2007 Dec;64(12):827-33</p> <p>(3) Medina-Ramón M, Schwartz J. Temperature, temperature extremes, and mortality: a study of acclimatization and effect modification in 50 US cities. <i>Occup Environ Med.</i> 2007 Dec;64(12):827-33.</p> <p>(4) Anderson BG, Bell ML. Weather-related mortality: how heat, cold, and heat waves affect mortality in the United States. <i>Epidemiology.</i> 2009 Mar;20(2):205 13.</p> <p>(5) Gasparrini A, Guo Y, Hashizume M, Lavigne E, Zanobetti A, Schwartz J, Tobias A, Tong S, Rocklöv J, Forsberg B, Leone M, De Sario M, Bell ML, Guo YL, Wu CF, Kan H, Yi SM, de Sousa Zanotti Stagliorio Coelh M, Saldiva PH, Honda Y, Kim H, Armstrong B. Mortality risk attributable to high and low ambient temperature: a multicountry observational study. <i>Lancet.</i> 2015 May 19.</p> <p>(6) Armstrong B, Gasparrini A, Hajat S. Estimating mortality displacement during and after heat waves. <i>Am J Epidemiol.</i> 2014 Jun 15;179(12):1405-6.</p> <p>(7) Saha MV, Davis RE, Hondula DM. Mortality displacement as a function of heat event strength in 7 US cities. <i>Am J Epidemiol.</i> 2014 Feb 15;179(4):467-74.</p> <p>(8) Zhang Y, Li S, Pan X, Tong S, Jaakkola JJ, Gasparrini A, Guo Y, Wang S. The effects of ambient temperature on cerebrovascular mortality: an epidemiologic study in four climatic zones in China. <i>Environ Health.</i> 2014 Apr 1;13(1):24</p> <p>(9) Cox LA Jr, Popken DA, Ricci PF. Warmer is healthier: effects on mortality rates of changes in average fine particulate matter (PM2.5) concentrations and temperatures in 100 U.S. cities. <i>Regul Toxicol Pharmacol.</i> 2013 Aug;66(3):336-46.</p>					

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Liana	Nathan	<p>Mental Health and Well-being is a major concern for me. I really enjoyed the discussion about both topics in relation to climate change. When thinking of climate change, many won't associate the effects it can have people's mental health. They only discuss the affects of the physical aspects.</p> <p>I am big believer in defining "environment" broadly meaning I think that our environment encompasses our well-being. I had never thought about the mental health aspects of climate change but it makes sense and your discussion proves to be very good. In the beginning, I understood your discussion of the mental affects concerning environmental disasters, but I'm happy that it was taken even further than that to talk about the side effects of rising temperatures and more precipitation. Two issues that are particularly important to me. I don't think people realize how severe both of those issues are, particularly in developing countries where people who do not have the resources to deal with these combating change.</p> <p>I believe that in order for this world to progress, that everyone's environment needs to be a safe, environmentally sound, and secure. With all of these changes happening to our environment due to climate change, how can people be okay and emotionally stable if their environments are not. I think this was a great addition to the draft, because it is very overlooked. Most people think that as long as people are physically okay, nothing else matters, but I believe very strongly in emotionally happy as well.</p>	Ch 8: Mental Health				We thank you for your comment and positive feedback on the chapter.
Cristina	Mullin	<p>When talking about vulnerable populations you identify populations of concern but do not identify geographic locations that are of particular concern to certain climate change impacts. Some areas of the U.S. are more vulnerable than others and if you can identify these areas it would be helpful. A summary table that indicates which areas are particularly vulnerable to different types of climate change impacts would be useful. For example, you could identify Florida and Louisiana as areas particularly</p>	Executive Summary				Impacts specific to certain regions are described where the underlying literature supports evidence of differential vulnerabilities. Please also see the section and figures on vulnerability mapping indexes in the chapter on Populations of Concern.

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		vulnerable to sea level rise and coastal storms/flooding because they are low lying areas. Others areas in the U.S. are going to be more susceptible to drought, etc. This may not be feasible for this report but it's an idea for the future.					
howard	feldman	<p>Key Finding #2: “Illness and Deaths are Related to Deviations from Seasonal Average [Very Likely, High Confidence]”</p> <p>Key Finding #2 Supporting statement “Days that are hotter than normal in the summer or colder than normal in the winter are both associated with increased levels of illness and death.”</p> <p>Comments</p> <p>We concur with that statement, as several studies have shown that large deviations from “normal” generate particularly high mortality. However, as stated above, the effects from extreme cold are longer lasting than are effects from extreme heat (see for example, (1)), most of which could be attributable to forward mortality displacement. The supporting statement does not make a distinction between the two despite evidence that the burden of illness and death is probably higher due to departures from normal during cold weather. Of note is the concession to the effect of acclimatization on page 68, line 13 which reports from Anderson and Bell (2011) that cities in the South and Southeast are the least sensitive to heat due to that effect. This reinforces the serious problem with the intentional disregard for acclimatization in Key Finding #1.</p>	Ch 2: Temperat ure- Related Impacts		51	9	The discussion of mortality related to cold and heat from non-extreme weather has been expanded, particularly in the traceable accounts.

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		<p>Regarding the significant level of inconsistency in studies of morbidity and how those results often contrast with same-endpoint mortality, we have observed the same problems with studies of air pollution. Administrative databases are transactional (largely financial and utilization) in nature and subject to different coding practices between healthcare systems. Likewise, we have seen regional differences in coding practices. Moreover, these data systems were not designed for research purposes so, unlike clinical data, there is considerable diagnostic/coding uncertainty in the data that can thwart efforts to compare morbidity with mortality.</p> <p>Reference</p> <p>(1) Guo, Y, Gasparrini A, Armstrong B et al. Global variation in the effects of ambient temperature on mortality: a systematic evaluation. <i>Epidemiology</i> 2014;25: 781-789)</p>					
Jalonne	White-Newsome	<p>U.S. Global Change Research Program 1717 Pennsylvania Ave, NW, Suite 250 Washington, D.C. 20006 USA</p> <p>June 8, 2015</p> <p>Dear USGCRP Author Team:</p>					<p>We greatly appreciate your positive comment about our report and hope that you find the content useful. The USGCRP Climate and Health Assessment represents an update on literature published since the SAP 4.6 (2008) and the NCA3 (2014) and includes recent sources and studies not included in either document (see appendix on Literature Review Process). The report also includes several research highlights about several very recent analyses conducted for inclusion in this report, though they do not employ the same methodologies as one comprehensive modeling effort, but describe the findings of several underlying studies.</p> <p>Report title: After consideration of this point, we still feel the existing title is clear and</p>

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		<p>Thank you for the opportunity to offer public comment on the draft report, The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment Draft USGCRP Climate and Health Assessment. We understand this is an important continuation of the National Climate Assessment that was released last year, and another component of the President’s Climate Action Plan (CAP). Since the release of the CAP in the summer of 2013, we, members of the Environmental Justice Leadership Forum on Climate Change (EJLFCC) have been heavily engaged in ensuring that the perspective and voices of low income, communities of color are included in most of the Federal policy initiatives called for under the in the CAP.</p> <p>The EJLFCC represents 45 Environmental Justice organizations in 23 states. Formed in 2008, the EJLFCC mobilizes and facilitates a national working group of environmental justice leaders who will interact with identified scientists/academics and representatives of mainstream environmental groups to catalyze and inform state and federal policy, and political and legislative action that will result in the development of just policies and mechanisms that equitably reduce carbon emissions in all communities.</p> <p>Over the past couple of years, we have enhanced our engagement by providing an EJ perspective on both Congressional and Administrative actions that impact, air, water, nutrition, climate change, federal EJ and technical guidance documents, the National Environmental Policy Act (NEPA), and many other important justice and environmental issues. Consequently, we are happy to provide our comments on this draft report.</p> <p>As a participant and commenter during the USGCRP public forum held last spring in Washington, DC, we are happy to see some of</p>					<p>accurate. The short title of the report is “USGCRP Climate and Health Assessment”; the long title is “The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment.” The front matter of the report includes a brief section describing and noting the importance of topics beyond the scope of this report, including economic impacts and cumulative impacts, to provide more context for an overarching perspective. Authors of the assessment are federal employees or contractors/ affiliates of federal agencies (see appendix on Process for the Development of this report). Many of these authors have connections with the public health sectors, and additional reviewers and review editors also have public health connections. Nevertheless, we appreciate this comment as we are developing a communications strategy and are looking for the best ways to engage audiences mentioned in the comment. The assessment does not include detailed discussions of climate mitigation, adaptation, or economic valuation and does not include policy discussions or recommendations. Consideration of greenhouse gas emissions pathways and human adaptive capacity (see also Front Matter and Introduction chapter) has been included as appropriate to assess projected climate impacts on human health. The report is also not a comprehensive research gap analysis, though each chapter does include a brief research needs section (see Front Matter) and limitations of surveillance and monitoring is discussed in The Introduction chapter and the Technical Support Document (Appendix).</p> <p>As noted in the preface, many of the cumulative or secondary impacts of climate</p>

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		<p>our concerns were addressed in this draft. We appreciate the effort of the author team to produce a comprehensive document that summarizes the peer-reviewed literature that delineates the impacts of climate on various sectors of health in the United States. We do, however, have some brief comments on the document as a whole.</p> <ul style="list-style-type: none"> • This report provides an update on the latest literature. It is not clear where the new research is inserted in the document that makes this more than a ‘literature review’. Rather than defining this as a ‘climate and health assessment’, it might better be termed a ‘review of the evidence’, as using ‘health assessment terminology’ means something completely different in the public health space. • While the Executive summary clearly states that this report will not include an economic valuation, we feel, at the minimum, the need for data on the health costs associated with each specific impact should be noted as a future research need. More emphasis needs to be placed on filling this research gap, that, we believe will help drive policy and infrastructure changes even more once the costs of inaction are fully appreciated. Particularly for our communities, the costs of inaction and costs of existing health burdens are the main driver of our work. • A missing component of this report is delineating the importance of a cumulative impacts strategy to address how health impacts are accounted for due to climate change. Using EPAs suggested guidance and/or other analysis techniques being utilized by other states (i.e. California, Minnesota, New Jersey), addressing this in this report is a great way to move the cumulative impacts conversation and efforts forward, at the federal agency level. Understanding the multiple stressors (both physical and non-chemical) can help lead to prioritizing actions – for both mitigation and adaptation – in our communities. • In general, the author teams do not appear to be composed of people/organizations that represent populations of concerns, or, represent the public health sector. Having diverse representation – particularly to inform this review – is critical and should be a part 					<p>change on human health are outside the scope of this report. However, we have addressed specific cumulative impacts in the Populations of Concern chapter and the chapter on Extreme Events, where the literature is available. Please also see the Front Matter Overarching Perspectives for consideration of cumulative impacts. The section on income equality has been revised and a reference has been added.</p> <p>The full title of the report is “The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment”. It is not labeled as a risk assessment or health impact assessment, which would imply new analysis, but a scientific assessment. Like other scientific assessments, such as the Intergovernmental Panel on Climate Change’s 5th Assessment Report, this assessment report relies on published literature. The research analyses conducted for inclusion in this report under the heading of “Research Highlights” is described in the Front Matter Guide to the Report and in more detail in the Appendix: Technical Support Document.</p> <p>As noted in the preface and the section on modeling approaches used in this report in the Introduction chapter, economic valuation is beyond the scope of this report. Similarly, these sections note that policy responses and adaptation are also beyond the scope of the report. The Front Matter notes that a comprehensive evaluation of research needs is beyond the scope of this report, but that each chapter concludes with a brief overview of research needs recognized during the assessment process.</p>

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		<p>of the engagement.</p> <ul style="list-style-type: none"> • These connections between climate and health are important, and despite the lack of granularity of this report, we hope that this will be useful in all levels (local, state, federal) of our advocacy. This might be a part of a broader outreach plan, but including ‘on the ground examples’ of how this report and the data presented could be used would be useful as well. Also, offering some sense of “on the ground solutions” should either be mentioned or a part of another smaller report. I think for this to really be a useful tool, learning and amplifying what ‘works’ is critical. • Again, there seems to be a missing piece in that the cumulative impacts of multiple stressors are not covered and/or mentioned explicitly in this Assessment. The cumulative impacts on Populations of Concern should be noted in Figure ES1 and/or Figure 9.9, as at the local/state level, tools and methods are being used in decision making. Cumulative impacts should be a part of the discussion, specifically as it relates to Chapter 9. • Evaluation is a huge gap in the climate and health space. This report should underscore the need for more focused research/efforts on evaluating public health actions, data, etc. that are successful in addressing/documenting the challenges of the current public health infrastructure and what is working and/or not working to address climate and health. Some potential areas of investigation – again, that should be noted in this report – include, but are not limited to: <ul style="list-style-type: none"> o Lack of access to real-time and/or near-time data to track the occurrences of morbidity and mortality related to heat and other extreme events. o Measuring the impact of adaptation practices. 					<p>The authors note the comments on the need to highlight cumulative stressors interacting with climate change stressors and to underscore evaluation of interventions as a research need. These concepts have been made clear in the Populations of Concern chapter.</p> <p>Infrastructure and health effects are covered in the Introduction chapter.</p> <p>In general, there is not a great deal of published literature on the vulnerability of rural populations for climate change related health effects. Research on rural populations often focuses on specific populations more likely found in rural areas such as farmers, indigenous populations, agriculture workers, etc. Where the research supports mention of these groups they are included in the chapters relevant to the health topic (e.g. the chapter on Heat-Related Death and Illness, the chapter on Mental Health and Well-Being, and the chapter on Populations of Concern). While the authors did not feel the amount of evidence on rural vulnerability required changes to be made to the introduction chapter, changes have been made to the chapters on Populations of Concern to acknowledge the potential vulnerabilities of rural populations and the need for research to better characterize rural vulnerability.</p> <p>Thank you for your detailed comments on the Populations of Concern chapter. As to the comment that there are other populations of concern that should be considered, e.g. people living in rural settings and those that are homeless or in transition, while we recognize the potential for disproportionate impacts of climate on the health and well-being of these</p>

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>o Understanding of the resources/ programs/policies across the nation that have improved the health protections of the general public</p> <p>o Has there been any measurement/tracking of how the health profile of communities change after a disaster? This is a research need.</p> <p>o What is the impact of infrastructure on public health that is destroyed/compromised due to climate change that lead to indirect health threats? (I.e. infrastructure around landfills, hazardous waste facilities that have been disturbed by extreme weather events).</p> <p>We also have some specific comments by chapter:</p> <ul style="list-style-type: none"> • Chapter 1, Page 30: Income equality. Does this represent general income equality by race, by gender, or by both? This is an important distinction because women are typically more impacted by climate, and having the dual role of being a woman, and a low income women, is an important distinction to account for. • Chapter 9 <p>o There are a couple of population of concerns that should be further noted in the text: people living in rural communities, and those that are homeless and/or in transition. There should be more of an effort to address the concerns or at least note the concerns of these specific populations.</p>					<p>populations, but the peer-reviewed literature is limited. No changes have been made to the text because given space limitations, we focused on broad trends. The populations of concern sections in other chapters, such as the Extreme Events chapter, do mention rural populations and the homeless specifically.</p> <p>With regard to the comment that the list of vulnerable populations should include Native Americans, no change has been made to the text because we have included an entire section on “Indigenous Peoples.”</p> <p>Regarding the comment that social cohesion should be included in the list of attributes in Figure 2, we have completely revised the graphic in response to this and other comments. It now focuses on how the Social Determinants of Health feed into the Elements of Vulnerability to ultimately affect health outcomes. Social cohesion is a component of the Social Determinants of Health. We have also added illustrative examples to help explain the points.</p> <p>Detailed coverage of economic valuation, adaptation or mitigation strategies, and any evaluation of their relative merit or value is beyond the scope of this report. Consideration of human adaptive capacity has been included as appropriate to assess projected climate impacts on human health.</p> <p>We have revised the chapter text to include a discussion of cumulative impacts in the introductory paragraphs of this chapter.</p> <p>In Research Needs, this chapter acknowledges the need for more focused evaluation of public</p>

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>o A contributor to health risk associated with climate change is the inability of populations to manage the cost of utilities – both energy, water, etc. – which can compound health concerns, impacted by climate change.</p> <p>o On pg. 338: The list of vulnerable populations should include Native Americans.</p> <p>o Pg. 386, Figure 2. In the box entitled, “Population Characteristics”, “social cohesion” should be included in the list of attributes.</p> <p>Again, thank you for the opportunity to comment and do not hesitate to contact our coordinator, Dr. Jalonne L. White-Newsome, Director of Federal Policy for WE ACT for Environmental Justice at jalonne@weact.org or 202-495-3036, if you have any additional questions.</p> <p>Yours in health and environment,</p> <p>Members of the Environmental Justice Leadership Forum on Climate Change</p> <p>Monique Harden Esq. Co-Director & Attorney Advocates for Environmental Human Rights New Orleans, Louisiana</p>					<p>health actions, data, etc. that document the challenges for health systems related to climate impacts on health.</p> <p>This section has been completely updated to respond to these comments.</p>

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>Pamela Miller Executive Director Alaska Community Action on Toxics Anchorage, Alaska</p> <p>Aaron Mair President Arbor Hill Environmental Justice Albany, New York</p> <p>Sarah Ames Board Member/Spokesperson Arctic Village Fairbanks, Alaska</p> <p>Miya Yoshitani Executive Director Asian Pacific Environmental Network</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>Oakland, California</p> <p>Nelson Carrasquillo</p> <p>Executive Director</p> <p>CATA</p> <p>Glassboro, New Jersey</p> <p>Shalini Gupta</p> <p>Executive Director</p> <p>Center for Earth, Energy & Democracy</p> <p>Minneapolis, Minnesota</p> <p>Brent Newell Esq.</p> <p>Legal Director</p> <p>Center on Race, Poverty & the Environment</p> <p>Oakland, California</p> <p>Hilton Kelley</p> <p>Founder and Executive Director</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>CIDA, Inc. Houston, Texas</p> <p>Byron Ramos Guidel Executive Director Communities for a Better Environment Oakland, California</p> <p>Sharon Lewis Executive Director Connecticut Coalition for Environmental Justice Hartford, Connecticut</p> <p>Dr. Beverly Wright Founder and Executive Director Deep South Environmental Justice Center New Orleans, Louisiana</p> <p>William Copeland Climate Justice Director</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>East Michigan Environmental Action Council Detroit, Michigan</p> <p>Mike Ewall Co-Director Energy Justice Network Philadelphia, Pennsylvania</p> <p>Diane Takvorian Executive Director Environmental Health Coalition National City, California</p> <p>Judith Anderson Community Health Coordinator Environmental Justice Action Group of Western New York Buffalo, New York</p> <p>Dr. Rose Brewer</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>Board Chair</p> <p>Environmental Justice Advocates of Minnesota</p> <p>Minneapolis, Minnesota</p> <p>Kari Fulton</p> <p>Interim Director</p> <p>Environmental Justice Climate Change Initiative</p> <p>Washington, DC</p> <p>Michele Roberts</p> <p>National Coordinator</p> <p>Environmental Justice Health Alliance for Chemical Policy Reform</p> <p>Brattleboro, Vermont</p> <p>Jill Mangaliman</p> <p>Executive Director</p> <p>Got Green</p> <p>Seattle, Washington</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>Donele Wilkins President/CEO Green Door Initiative, Inc Detroit, Michigan</p> <p>Dr. Mildred McClain Executive Director Harambee House Savannah, Georgia</p> <p>Tom Goldtooth Executive Director Indigenous Environmental Network, Bemidji, Minnesota</p> <p>Dr. Charlotte Keys Director Jesus Peoples Against Pollution Columbia, Mississippi</p>					

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		<p>Jose Bravo National Coordinator Coming Clean Brattleboro, Vermont</p> <p>Dana Beasley Brown Chairperson Kentuckians for the Commonwealth London, Kentucky</p> <p>Rev. Leo Woodberry Director Kingdom Living Temple Florence, South Carolina</p> <p>Fred Brown Associate Director for Program Development Kingsley Association</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>Pittsburgh, Pennsylvania</p> <p>Savi Horne Executive Director Land Loss Prevention Center Durham, North Carolina</p> <p>Dr. Antonio Lopez Executive Director Little Village Environmental Justice Organization Chicago, Illinois</p> <p>Richard Moore Coordinator Los Jardines Institute (The Gardens Institute) Albuquerque, New Mexico</p> <p>Carmen Llanes Pulido Community Programs Coordinator: Go! Austin/Vamos! Austin (GAVA) – Dove Springs</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>Marathon Kids People Austin, Texas</p> <p>Nicky Sheats Executive Director New Jersey Environmental Justice Alliance Trenton, New Jersey</p> <p>Jonathan Ostar Executive Director OPAL Environmental Justice Oregon Portland, Oregon</p> <p>Susana Almanza Director People Organized in Defense of Earth and Her Resources Austin, Texas</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>Dr. Antonio Díaz</p> <p>Director</p> <p>People Organizing to Demand</p> <p>Environmental and Economic Rights</p> <p>San Francisco, California</p> <p>Martha Dina Arguello</p> <p>Executive Director</p> <p>Physicians for Social Responsibility – Los Angeles</p> <p>Los Angeles, California</p> <p>Deeohn Ferris</p> <p>Executive Director</p> <p>Sustainable Community Development Group</p> <p>Washington, DC</p> <p>Juan Parras</p> <p>Executive Director</p> <p>TEJAS</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>Houston, Texas</p> <p>Dr. Robert Bullard</p> <p>School of Public Affairs , Dean</p> <p>Texas Southern University</p> <p>Houston, Texas</p> <p>Tammy Bang-Luu</p> <p>Associate Director</p> <p>The Labor/Community Strategy Center</p> <p>Los Angeles, California</p> <p>Peggy Shepard</p> <p>Executive Director</p> <p>WE ACT for Environmental Justice</p> <p>New York, New York</p> <p>Stephanie Tyree</p> <p>Director of Community Engagement & Policy</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		West Virginia Community Development Hub Clarksburg, West Virginia					
howard	feldman	<p>Key Finding #2 Supporting statement</p> <p>“While large health effects are observed for extreme temperature events, mortality effects are also seen for smaller changes of even a few degrees from seasonal averages, and small changes from average temperature occur much more frequently than extreme events.”</p> <p>Comments</p> <p>We concur with the report’s acknowledged uncertainty about this statement, based particularly on the Bobb et al 2014 (1) analysis that observed that the number of excess deaths attributable to each 10 degree F increase in same day summer temperature in the US decreased significantly from 1990 to 2005. This resiliency indicates that smaller temperature increases (i.e., “a few degrees” – certainly less than 10 degrees) would have little if any effect on mortality as time progresses.</p> <p>Basu and Samet (2) raised a key issue pertaining to heat exposure measurement. The “micro-environmental” model of exposure assessment considers exposure to pollution or—in this case, heat or cold—as the “time-weighted” sum of pollutant concentrations in the places where people actually spend time. This contrasts with “place-time” investigations (the typical approach) that assess risks associated with being in specific geographic locations with their attendant ambient temperatures. In the place-time model, outdoor temperature is a surrogate for personal exposure to heat, even</p>	Ch 2: Temperat ure- Related Impacts		51	9	<p>The text has been revised to incorporate an augmented discussion of the relationship between measured temperatures and actual temperature exposure.</p> <p>The authors determined that the existing discussion of adaptation is adequate, and have not made changes to the text.</p>

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>though people in the U.S. generally spend most of their time indoors. (3) This model inappropriately assumes all persons who occupy a specified geographic area experience the same exposure. While a more convenient model, it mischaracterizes individual personal exposure, which is typically tempered by adaptive behaviors; e.g., staying indoors with air conditioning. Accepting the fact that ambient temperatures are a flawed metric, the climate science field is left with this flawed construct to predict mortality and morbidity. Ideally, one should make these predictions with greater consideration of temperature exposures within actual microenvironments. Phoenix is an example of an area where the effect of microenvironments is clearly observed. Despite that city routinely experiencing potentially life-threatening summertime temperatures, studies of excess heat mortality there have consistently found little evidence of any major heat-attributable excess mortality impacts. Moreover, the most recent data indicate a generalized decreasing trend of heat-related/associated deaths. (4) Reasons given include extensive access to air conditioning, widespread public recognition of risks, and willingness to make appropriate adjustments to minimize heat exposure.</p> <p>References</p> <p>(1) Bobb JF, Peng RD, Bell ML, Dominici F. Heat-related mortality and adaptation to heat in the United States. <i>Environ Health Perspect.</i> 2014 Aug;122(8):811-6.</p> <p>(2) Basu R and Samet J (2002). Relation between elevated ambient temperature and mortality: A review of the epidemiologic evidence. <i>Epidemiol Rev.</i> 24,190-202.</p> <p>(3) Davis RE et al. Changing Heat-Related Mortality in the United States. <i>Environ Health Perspect.</i> (2003); 111: 1712-1718.</p> <p>(4) Arizona Department of Health Services.</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		http://www.azdhs.gov/phs/oeh/extreme/news.php (accessed May 11, 2015)					
howard	feldman	<p>Key Finding #3: “Changing Tolerance to Extreme Heat [Very Likely, High Confidence]”</p> <p>Key Finding #3 Supporting statement “Observed increase in tolerance to extreme heat.”</p> <p>Comment</p> <p>We concur with this statement and the report’s acknowledgement of various forms of adaptation that could be responsible for an increased tolerance of extreme heat. All of the listed forms have likely contributed to some extent to increased tolerance, but the increased prevalence of air conditioning and innate physiological adaptive responses have more scientific support. Evidence exists that heat tolerance increases even within a single summer season. Anderson and Bell (1) observed a 5.04% during the first heat wave of the season vs 2.65% during the later heat waves vs non-heat wave days.</p> <p>Reference</p> <p>(1) Anderson GB and Bell ML. Heat waves in the United States: mortality risk during heat waves and effect modification by heat</p>	Ch 2: Temperature-Related Impacts		51	16	No change has been made to the text.

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		wave characteristics in 43 US communities. Environ Health Perspect 119:210-218 (2011)					
howard	feldman	<p>Key Finding #3 Supporting statement</p> <p>“Deaths from extreme heat will to continue to increase.”</p> <p>Comments</p> <p>The report acknowledges the major uncertainty (“challenging”) regarding the quantitative impact that adaptation plays in mitigating the effects of extreme heat. The aging of the US population in concert with the reasonable assumption of forward mortality displacement will itself increase heat-related mortality with or without technological adaptive measures such as AC. But, with such countermeasures, age-adjusted death rates will not necessarily increase.</p> <p>This supporting statement is based on modeled forecasts/predictions, not actual data. Deschênes’ and Moretti’s (1) analysis of migration—a real-world empirically-based ‘natural experiment’—suggests that relocating to hot weather climates—and physiologically adapting to hotter weather—is beneficial relative to remaining in a cold climate region. Geographic mobility is commonly overlooked as a determinant of mortality, and this migration has accounted for 8%-15% of the total gain in life expectancy experienced by the US population over the past 30 years (1). Given the expected continuation of this migration, we agree that this supporting statement is of low confidence. In fact, given the state of the evidence, there are compelling reasons to conclude that this statement is incorrect and should be removed from the report altogether.</p>	Ch 2: Temperature-Related Impacts		70	15	The text has been revised to incorporate this suggestion.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>Reference</p> <p>(1) Deschênes O, Moretti E. Extreme weather events, mortality, and migration. Review of Economics and Statistics, November 2009, 91(4): 659-681</p>					
howard	feldman	<p>Key Finding #3 Supporting statement</p> <p>“The elderly have a higher risk of dying due to increasing frequency, intensity, and duration of future heat waves.”</p> <p>Comments</p> <p>We agree that the elderly generally have a higher risk of death due to heat waves. The majority of research on heat waves and mortality has attributed some, to virtually all, of that increased frequency on forward displacement. In a review of the literature (14 studies) on the mortality impacts of European heat waves (1), 4 reported a large/high degree of short-term displacement (~90%), 3 reported moderate displacement, 1 reported small to moderate displacement, 1 reported limited displacement, 1 reported “some” displacement, and 4 reported no displacement.</p> <p>Deschênes and Moretti (2) conducted a particularly robust analysis of extreme weather events, mortality, and migration. The study concluded,</p>	Ch 2: Temperature-Related Impacts		71	15	We greatly appreciate your feedback.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>“The increase in mortality that occurs in the days immediately following heat waves appears entirely driven by temporal displacement.”</p> <p>This temporal displacement is also known as forward mortality displacement and “harvesting”, in which deaths among the frail are merely accelerated by a few days, thus having no permanent effect on mortality rates since rates decline to levels below expected daily rates in 2-7 days. On the other hand, mortality from extreme cold does not return to normal background rates for 3-4 weeks depending on the study, e.g., (3 & 4).</p> <p>References</p> <p>(1) Martiello MA, Giacchi MV. High temperatures and health outcomes: a review of the literature. <i>Scandinavian Journal of Public Health</i>, 2010; 38: 82-837</p> <p>(2) Deschênes O, Moretti E. Extreme weather events, mortality, and migration. <i>Review of Economics and Statistics</i>, November 2009, 91(4): 659-681</p> <p>(3) Anderson GB and Bell ML. Heat waves in the United States: mortality risk during heat waves and effect modification by heat wave characteristics in 43 US communities. <i>Environ Health Perspect</i> 119:210-218 (2011)</p> <p>(4) Gasparri A, Armstrong B, Kenward MG. Distributed lag non-linear models. <i>Statist. Med.</i> 2010, 29 2224-2234.</p>					
howard	feldman	Key Finding #3 Supporting statement	Ch 2: Temperat ure-		71	15	The text has been changed to address this comment. While there were a limited amount of studies that found an increased risk in adults

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>“Children and working age adults have increased vulnerability to heat-related illness.”</p> <p>Comments</p> <p>This statement is somewhat ambiguous. Does the statement assert that children and working age adults are at increased risk of heat-related illness? If so, we agree. Or, does the statement assert that this inherent increased risk will be even greater due to climate change? If so, we do not have high confidence in it. Unlike rapidly changeable weather, climate change evolves slowly—perhaps only a few degrees over a lifetime. Bobb et al 2014 (1) observed that the number of excess deaths attributable to each 10 degree F increase in the same day summer temperature in the US decreased significantly from 1990 to 2005. This resiliency indicates that smaller temperature increases (i.e., “a few degrees” – certainly less than 10 degrees over a lifetime) would have little if any effect on mortality as time progresses. Likewise, it seems logical to also assume that the frequency of heat-related illnesses would change little if any due to climate change, assuming that all current adaptive mechanisms/actions remain constant. Regarding heat injury due to heat waves, epidemiologic studies have generally failed to find significantly increased mortality among children and infants (in (2)).</p> <p>References</p> <p>(1) Bobb JF, Peng RD, Bell ML, Dominici F. Heat-related mortality and adaptation to heat in the United States. Environ Health Perspect. 2014 Aug;122(8):811-6</p>	Related Impacts				<p><65, the majority of evidence points to increased risk for outdoor workers. Since some reviewers found the phrase “working age adults” to be confusing, the text has been revised to focus on risk to outdoor workers.</p> <p>Further, children and outdoor workers are identified as vulnerable subpopulations for climate-related health effects in the Balbus & Malina article, as well as other references listed in the chapter.</p>

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		(2) Balbus JM, Malina C. Identifying vulnerable subpopulations for climate change health effects in the United States. J Occup Environ Med. 2009;51:33-37.					
howard	feldman	<p>Key Finding #3 Supporting statement</p> <p>“The socially isolated, economically disadvantaged, some communities of color, and those with chronic illness are also especially vulnerable to death or illness.”</p> <p>Comment</p> <p>We agree that these, and other factors, modify the effects of heat and cold on the risk of mortality and morbidity.</p>	Ch 2: Temperature-Related Impacts		72	1	We appreciate your feedback.
howard	feldman	<p>Comparison to IPCC 5th Assessment Report</p> <p>Comment</p> <p>Chapter 11 of the IPCC Report devotes a section to adaptation. It notes that ecosystems, water supply and sanitation, agriculture, infrastructure, energy and transportation, land use management, and other technological innovations play an important part in determining the risks of disease and injury resulting from climate change. The USGCRP report has no reasonable basis for systematically excluding adaptive responses in some of its key findings. This information is equally critical to the stakeholders for whom this report was written.</p>	Ch 2: Temperature-Related Impacts		66	15	<p>The assessment does not include detailed discussions of climate mitigation, adaptation, or economic valuation. Consideration of greenhouse gas emissions pathways and human adaptive capacity has been included as appropriate to assess projected climate impacts on human health.</p> <p>No change has been made to the text.</p>

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
Cristina	Mullin	<p>Topic That Warrents Further Research....</p> <p>Floodwaters after severe storms such as hurricanes may contain sewage, degraded materials, and other contaminates that can then be aerosolized due to the high winds of the hurricane. These aerosols during or directly after a storm can be harmful to human health if inhaled. Studies have shown an increase in hospital visits for respiratory health problems following severe weather events such as hurricanes. There have also been studies on the “Sandy Cough” or “Katrina Cough” which were chronic coughs attributed to those hurricanes.</p> <p>Hurricanes are the perfect storm for aerosol production!</p> <p>In theory, an event with high wind speeds and large storm surge would be the “perfect storm” for mass sea spray production and input of bioaerosols and particulates into the coastal atmosphere. Marine aerosols produced at the sea surface can travel variable distances depending mainly on humidity, wind speed, and particle size. Overall knowledge of health concerns associated with air-sea interaction, production, and composition of sea spray aerosols/particulates are not fully understood and have not been thoroughly studied. Storm surge waters produced by a hurricane may contain chemicals, bacteria, and pathogens caused by sewage overflow or inundation of facilities and homes that may become aerosolized. High winds during a hurricane could release larger particulates into the atmosphere which may contribute to respiratory illness along with smaller sea spray aerosols. It is currently unknown whether respiratory symptoms in humans show up after hurricanes due to chemicals or mold bioaerosols they are exposed to indoors due to flooding, enhanced sea spray production of harmful bioaerosols from sewage overflow or other contaminates in the water when decreases outdoor air quality, or from inorganic particulates released into the atmosphere by high winds; this topic warrants further research.</p>	Ch 7: Extreme Events		267		The points the comment raises is beyond the scope of this chapter. No change has been made to the text.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
Claire	Barnett	<p>Thank you. I appreciate the opportunity to comment on this ground-breaking Health Assessment. Like any new effort, there are gaps to fill, including the absence of insightful analyses of the health impacts on children.</p> <p>I am particularly concerned at the relative lack of attention to health impacts on children and on their k-12 schools in this Assessment, and as a result, I strongly recommend that EPA and CDC co-convene (with NIEHS, FEMA, NIOSH) a federal advisory work group on children's environmental health, climate, and schools, including pediatric environmental health experts, child health advocates, and researchers. The information in the draft Assessment is not yet sufficiently robust or thought-through regarding health effects for any agency to develop an effective action plan.</p> <p>Also, as recommended by UNICEF (Children on the Front Line, 2014) we think that the risks to children from climate change argue persuasively for a child-centered approach to climate because: 1- children are the most vulnerable and have a longer 'shelf-life', and 2- children will inherit our collective failure to address climate, and will possibly have diminished intellectual and physical capacities to do so, due to our current inaction on several issues impacting children.</p> <p>I have focused my comments on the Executive Summary and on the Chapters on Air Quality, Heat, and Populations of Concern.</p> <p>The following list of citations may be helpful.</p>	Ch 1: Preface and Introduction				<p>Thank you for your comment and for providing references to scientific literature regarding health impacts on children in the context of their exposures in schools. We incorporated this material within the limitations of space constraints and author judgment. The suggestion to convene a federal advising working group is outside the scope of this report. Impacts on the health of children are described in detail in the Populations of Concern chapter in a section on children and pregnant women, and are also noted throughout the report in the populations of concern sections within the chapters, where supported by the literature.</p>

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>1. US Environmental Protection Agency. Protecting Children’s Environmental Health. Available at: http://www2.epa.gov/children. Accessed on January 28, 2015.</p> <p>2. US Environmental Protection Agency. EPA/NIEHS Children’s Environmental Health and Disease Prevention Research Centers (CEHCs). Available at: http://epa.gov/ncer/childrencenters/. Accessed on January 28, 2015.</p> <p>3. American Academy of Pediatrics Council on Environmental Health. Etzel RA, Pediatric Environmental Health, 3rd Edition. Elk Grove Village, IL: American Academy of Pediatrics; 2012.</p> <p>4. US Environmental Protection Agency. Children’s Health: Regulations. Available at: http://www2.epa.gov/children/regulations. Accessed on January 28, 2015.</p> <p>5. Paulson J, Barnett C. Who’s In Charge of Children’s Environmental Health at School? New Solutions: A Journal of Environmental and Occupational Health Policy. 2010;20(1):3-23.</p> <p>6. US Government Accountability Office. School Facilities: Conditions of America’s Schools. Washington, DC: US Government Accountability Office; 1995.</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>7. Trousdale K, Martin J, Abulafia L, Barnett C, Westinghouse C. Children’s environmental health: The school environment. Intellectual and Developmental Disabilities. 2010;48(2):135-144.</p> <p>8. Neal DE. Healthy Schools: A Major Front in the Fight for Environmental Justice. Environmental Law. 2008;38:473- 493.</p> <p>9. US Government Accountability Office. School Facilities: Conditions of America’s Schools. Washington, DC: US Government Accountability Office; 1995.</p> <p>10. National Center for Education Statistics. Condition of America’s Public School Facilities: 1999. Washington, DC: US Department of Education; 2000.</p> <p>11. America Society of Civil Engineers. 2013 Report Card for America’s Infrastructure. Available at: http://www.infrastructurereportcard.org/a/browser-options/downloads/2013-Report-Card.pdf. Accessed on January 28, 2015.</p> <p>12. Spengler JD. Climate change, indoor environments, and health. Indoor Air. 2012;22(2):89–95.</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>13. National Conference of State Legislators. Carbon Monoxide Detector Requirements, Laws and Regulations. Available at: http://www.ncsl.org/research/environment-and-natural-resources/carbon-monoxide-detectors-state-statutes.aspx. Accessed on January 28, 2015.</p> <p>14. Haverinen-Shaughnessy U, Moschandreas DJ, Shaughnessy RJ. Association between substandard classroom ventilation rates and students' academic achievement. <i>Indoor Air</i>. 2011;21(2):121-131.</p> <p>15. Building Green. Radon and Schools: A Study in Denial. Available at: http://www.buildinggreen.com/auth/article.cfm/2013/12/30/Radon-and-Schools-A-Study-in-Denial/. Accessed on January 28, 2015.</p> <p>16. National Research Council. Climate Change, the Indoor Environment, and Health. Washington, DC: The National Academies Press; 2011.</p> <p>17. US Environmental Protection Agency. Polychlorinated biphenyls (PBCs): PCBs in Caulk and Older Buildings. Available at: http://www.epa.gov/pcbsincaulk/. Accessed on January 28, 2015.</p> <p>18. US Environmental Protection Agency. Healthy School Environments: Chemical Use and Management. Available at:</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>http://www.epa.gov/schools/chemicals/. Accessed on January 28, 2015.</p> <p>19. US Environmental Protection Agency. Health School Environments: School Siting Guidelines. Available at: http://www.epa.gov/schools/guidelinstools/siting/. Accessed on January 28, 2015.</p> <p>20. Loukmas H, Boese S, McCoy M. Unwanted Exposure: Preventing Environmental Threats to the Health of New York State's Children: A report of the Children's Environmental Health Partnership of New York State. Learning Disabilities Association of New York State and Healthy Schools Network, Inc; 2007.</p> <p>21. Bartlett, S, Petrarca, J. Schools of Ground Zero: Early Lessons Learned in Children's Environmental Health. Washington, DC: American Public Health Association; 2002.</p> <p>22. US Environmental Protection Agency. America's Children and the Environment, 3rd ed. Washington, DC: US Environmental Protection Agency; 2013.</p> <p>23. US Environmental Protection Agency. Healthy School Environments: State School Environmental Health Guidelines. Available at: http://www.epa.gov/schools/guidelinstools/ehguide/. Accessed on January 28, 2015.</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>24. Trasande L, Liu Y. Reducing the staggering cost of environmental disease in children, estimated at \$76.6 billion in 2008. Health Affairs. 2011;30(5):863-70.</p> <p>25. President’s Task Force on Environmental Health Risks and Safety Risks to Children. Coordinated Federal Action Plan to Reduce Racial and Asthma Ethnic Disparities. Washington, DC: US Environmental Protection Agency; 2012.</p> <p>26. Lin S, Jones R, Liu X, Hwang S. Impact of the Return to School on Childhood Asthma Burden in New York State. International Journal of Occupational and Environmental Health. 2011;17(1):9-16.</p> <p>27. Mazurek J, Filios M, Harrison R, et al. Work-related asthma in the educational services industry: California, Massachusetts, Michigan, and New Jersey, 1993-2000. American Journal Of Industrial Medicine. 2007;51(1):47-49.</p> <p>28. National Research Council. Green Schools: Attributes for Health and Learning. Washington, DC: The National Academies Press; 2006.</p> <p>29. US Environmental Protection Agency. IAQ Tools for Schools: Health and Achievement. Available at:</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>http://www.epa.gov/iaq/schools/benefits.html. Accessed on January 28, 2015.</p> <p>30. Shendell DG, Barnett C, Boese S. Science-based recommendations to prevent or reduce potential exposure to biological, chemical, and physical agents in schools. <i>Journal of School Health</i>.2004;74(10):390–396.</p> <p>31. Mendell MJ, Heath GA. Do Indoor Pollutants and Thermal Conditions In Schools Influence Student Performance? A Critical review of the Literature. <i>Indoor Air</i>. 2005;15(1):27-52.</p> <p>32. Daisey JM, Angell WJ, Apte MG. Indoor Air Quality, Ventilation and Health Symptoms in Schools: An Analysis of Existing Information. <i>Indoor Air</i>. 2003;13(1):53-64.</p> <p>33. Foscue K, Harvey M. A statewide multiagency intervention model for empowering schools to improve indoor environmental quality. <i>Journal of Environmental Health</i>. 2011;74(2): 8-15.</p> <p>34. Pediatric Environmental Health Specialty Units. The Pediatric Environmental Health Specialty Units: A Network of Experts in Children’s Environmental Health. Available at: http://www.pehsu.net/aboutus.html. Accessed on January 28, 2015.</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>35. The Center for Green Schools. 2013 State of Our Schools Report. Washington, DC: US Green Building Council; 2013.</p> <p>36. Kats G. Greening America’s Schools: Costs and Benefits. Washington, DC: Capital E; 2006. Available at: http://www.usgbc.org/Docs/Archive/General/Docs2908.pdf. Accessed on February 1, 2015.</p>					
Lewis	Harriman	<p>General Comments - Chapter 3 - Air Quality</p> <p>The air quality section of the USGCRP Climate and Health Assessment report is a useful beginning of a thoughtful, well-balanced discussion. At the same time, the range of discussion with respect to the relationship between outdoor and indoor air quality is limited and therefore the scope and validity of the overall air quality assessment appear to have significant limitations, resulting in an underestimation of the indoor health risks associated with climate change.</p>	Ch 3: Air Quality				We agree this is a complex topic and could well be discussed in further detail; however, space is limited
Cristina	Mullin	<p>Missing information</p> <p>Climate change induced sea level rise will result in salt water intrusion into fresh water resources such as wells. This will reduce the water resources available in certain coastal areas or will force people to have to move or switch over to sewers. It may also be an issue for entire communities if entire reservoirs are contaminated.</p>	Ch 5: Water-Related Illness				We have revised the text in section 5.4.1 to include mention of the potential health implications of saltwater intrusion impacting potable water availability/supply within the US.
Lewis	Harriman	<p>Suggestions for improvement: Section 3.5 - Indoor Air Quality Impacts</p> <p>This section of the draft report is useful and well-constructed. Yet it lacks depth. Without a more comprehensive elaboration of the chain of events and dynamics of current societal imperatives and the resulting occupant responses, the indoor health risks of climate change may be overlooked, because they may not be clearly understood. This would be unfortunate, given the fact that in the US, most of the hours of our expected 78-year life spans are spent</p>	Ch 3: Air Quality		96	27	The comments are much appreciated, and we agree that further detail would be useful; however, space considerations limit the length of the discussion. Therefore, we focused on broad trends rather than delving too deeply or providing such a level of specificity.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>indoors. The prudent selection of research priorities, the construction of wise public policy and the avoidance of unintended consequences of any regulatory intervention demands a clear understanding of the mechanisms as well as the extent of indoor air health risks driven by climate change.</p> <p>Factors that deserve additional discussion to achieve a more robust and clear understanding of indoor climate-change health risks should include:</p> <ul style="list-style-type: none"> • The factors and dynamics affecting indoor health risks are different for new buildings vs. existing buildings. <p>New buildings are much more air-tight than most existing buildings. Occupants of existing buildings are more at risk from infiltration of outdoor air that will carry increasing amounts of ozone, PM 2.5 and humidity as the climate changes. Occupants of the more air-tight new and retrofitted buildings are at greater risk from internally-generated pollutants, including water vapor, emissions of volatile organics and fine particles from cooking, and products of combustion that under current practices are not adequately removed from the indoor environment. In both cases, the negative effects of increasing indoor pollutants affect the large and more vulnerable populations of the very old, the very young and those occupying lower-income, high-density housing. The mechanisms and societal factors that drive risks in new vs. existing buildings are therefore different, and each deserves a more detailed discussion in the climate change assessment. Existing buildings far outnumber new buildings. Without detail about the mechanisms in each, it will be difficult to assess the numbers of people at risk from the different phenomena, which will lead to unintended consequences of any future public policy or regulatory intervention to mitigate the effects of climate change on indoor exposures.</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<ul style="list-style-type: none"> • Occupant response to climate change increases energy use and therefore increases ozone and PM 2.5 both indoors and outdoors <p>The draft report notes that PM 2.5, ozone and total cooling loads are increasing. But the feedback-loop effect of this increase are not adequately discussed. Given that energy used for buildings accounts for about 40% of global energy consumption, more than any other single factor, source energy used for activities in buildings affects the rate of increase in global fossil fuel consumption and therefore the concentration of both outdoor and indoor ozone, PM 2.5 and VOC's and their effects on health risks. What this section does not yet discuss is the effect these increases have on energy used indoors to mitigate health effects of increased pollutant concentration.</p> <p>Based on the experience of human behavior since the advent of mechanical cooling, to avoid negative health effects of increasing indoor pollutants, more energy will be consumed, most often in the form of electrical energy. In the US, the average increase in energy consumption is 3 units of fossil fuel source energy burned for every unit of electrical energy consumed at the site. Increased filtration to remove increased particulates from both indoor and outdoor air requires increased fan horsepower and therefore electrical energy consumption. Likewise, increased cooling annual load results in increased electrical energy used for cooling, again increasing health risks through higher carbon, particulate and greenhouse gas emissions at power plants. Similarly, the filtration required to remove particulate and ozone from incoming outdoor ventilation air also demands increased fan energy and cooling energy—again increasing source energy consumption with a multiplier of roughly 3 units of source energy for every unit of increased electrical consumption on site.</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>Summary</p> <p>The current content of the indoor air section of the assessment represents a good start. But it needs further detail and clarification of the dynamics of each form of indoor health risk. This further discussion will then provide a clear and compelling foundation for research priorities and the public policies that will either increase or reduce risks for the great majority of the hours, days and years lived by americans as the global climate changes over the coming decades.</p>					
Cristina	Mullin	Table 1: Health Impacts of Extreme Events on page 253 should include “respiratory illness” as an Example Health Outcome from flooding and other hazards related to extreme precipitation, hurricanes, and other coastal storms.	Ch 7: Extreme Events	1	253		After further consideration, the authors decided to not make the suggested change. The goal of this table is to provide a broad, but not comprehensive overview of the extreme events and associated health effects of covered in the chapter.
Cristina	Mullin	7.5.2 Health Impacts Associated with Wind Exposure page 260 – I would include that increased wind strength/duration increases particulate and aerosol concentrations in the air which can decrease air quality and increase respiratory illness.	Ch 7: Extreme Events		260		After consideration of this point, we still feel the existing examples are sufficient. No change has been made to the text.
howard	feldman	<p>Comparison to IPCC 5th Assessment Report</p> <p>Comment</p> <p>Regarding the mortality displacement issue, Chapter 11 provides evidence that supports this theory:</p> <p>The extreme heat wave in Europe in 2003 led to numerous epidemiological studies. Reports from France (Fouillet et al., 2008) concluded that most of the extra deaths occurred in elderly people (80% of those who died were older than 75 years). Questions were raised at the time as to why this event had such a devastating effect (Kosatsky, 2005). It is still not clear, but one contributing factor may have been the relatively mild influenza season the year before.</p>	Ch 2: Temperature-Related Impacts		66	33	While the referenced text was not originally addressing mortality displacement, additional text has been included on this topic in Section 2.6.1.

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		<p>Recent studies have found that when the previous year’s winter mortality is low, the effect of summer heat is increased (Rocklov and Forsberg, 2009; Ha et al., 2011) because mild winters may leave a higher proportion of vulnerable people (Stafoggia et al., 2009).</p> <p>“Vulnerable people” are the unhealthy/frail individuals whose death was hastened by a few days due to summer heat. This has no permanent effect on mortality rates, only temporary (1,2,3).</p> <p>References</p> <p>(1) Deschênes O, Moretti E. Extreme weather events, mortality, and migration. Review of Economics and Statistics, November 2009, 91(4): 659-681</p> <p>(2) Anderson GB and Bell ML. Heat waves in the United States: mortality risk during heat waves and effect modification by heat wave characteristics in 43 US communities. Environ Health Perspect 119:210-218 (2011)</p> <p>(3) Gasparrini A, Armstrong B, Kenward MG. Distributed lag non-linear models. Statist. Med. 2010, 29 2224-2234.</p>					
howard	feldman	<p>Finding #1: EPA Claims Exacerbated Ozone Health Impacts</p> <p>Changes to the climate will tend to make it harder for any given regulatory approach to reduce ground-level ozone pollution in the future as meteorological conditions become increasingly conducive to forming ozone over most of the United States. Unless offset by additional emissions reductions, these climate-driven increases in ozone will cause premature deaths, hospital visits, lost school days, and acute respiratory symptoms. [Likely, High Confidence]</p>	Ch 3: Air Quality				<p>We believe the existing text is clear and accurate. We are not advocating a policy, but rather characterizing the expected impact of climate on human health if present trends continue unabated.</p>

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>Comments</p> <p>Key Finding #1 is flawed for two reasons. First, it contains concerning phrases that reference a specific policy solution: “harder for any given regulatory approach to reduce ground-level ozone pollution” and “[u]nless offset by additional emissions reductions.” Both of these phrases heavily imply that the referenced policy solution is the appropriate vehicle for addressing these estimated health issues. Yet the role of this assessment is not to provide policy solutions, as the authors recognize in the Preface: “The focus of this assessment is on the health impacts of climate change. The assessment does not include detailed discussion of climate mitigation, adaptation, or economic valuation, nor does it make policy recommendations.” Draft Assessment at 24. It is improper for the assessment to refer to a specific policy solution, that of reducing emissions, when the role of this document is to outline projected health effects. Second, as discussed in more detail later in API and UARG’s comments, Key Finding #1 overestimates the strength of the evidence concerning health effects at current environmental levels and fails to account for important uncertainties.</p> <p>Recommendation</p> <p>Changes to the climate will result in meteorological conditions that are increasingly conducive to forming ozone over most of the United States. Assuming current emission levels, these climate-driven increases in ozone may cause some premature deaths, hospital visits, lost school days, and acute respiratory symptoms, although the causal relationship between ozone exposure and</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>health effects is highly uncertain in the assumed exposure concentration range.</p> <p>Section 3.3.1, Pages 89- 90, Lines 36-5</p> <p>“While the emissions of pollutants that form ozone . . . are expected to decrease . . . modeling studies that assume a changing climate but constant precursor emissions suggest that climate change will result in meteorological conditions that are more favorable for ozone formation. In the context of trying to attain national air quality standards for ground-level ozone, these climate-driven changes in meteorological conditions are collectively referred to as the ‘climate penalty’ (Jacob and Winner 2009; Wu et al. 2008).”</p> <p>The phrase “In the context of trying to attain national air quality standards for ground-level ozone,” inappropriately suggests that the Clean Air Act National Ambient Air Quality Standards (NAAQS) is the proper vehicle for addressing all ozone-related health effects from climate change. As discussed above, this implied advocacy for a specific policy is outside the purpose of this document and as such should be removed.</p> <p>Section 3.3.1, BOX: Ozone 101, Page 91, Lines 1-5</p> <p>“Climate change is expected to increase O3 pollution in the future over the United States, in part due to higher temperatures and more frequent stagnant air conditions (Jacob and Winner 2009). If these increases are not offset by additional emissions reductions, these</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>climate-driven increases in ozone will cause premature deaths, hospital visits, lost school days, and acute respiratory symptoms.”</p> <p>The phrase “[i]f these increases are not offset by additional emissions reductions” implies a specific policy solution. As discussed above, this implied advocacy for a specific policy is inappropriate in this document.</p> <p>Recommendation</p> <p>Revise the above statement as such: “Assuming constant emissions levels, these climate-driven increases in ozone will cause premature deaths, hospital visits, lost school days, and acute respiratory symptoms.”</p>					
howard	feldman	<p>“While the emissions of pollutants that form ozone . . . are expected to decrease . . . modeling studies that assume a changing climate but constant precursor emissions suggest that climate change will result in meteorological conditions that are more favorable for ozone formation. In the context of trying to attain national air quality standards for ground-level ozone, these climate-driven changes in meteorological conditions are collectively referred to as the ‘climate penalty’ (Jacob and Winner 2009; Wu et al. 2008).”</p> <p>The phrase “In the context of trying to attain national air quality standards for ground-level ozone,” inappropriately suggests that the Clean Air Act National Ambient Air Quality Standards (NAAQS) is the proper vehicle for addressing all ozone-related health effects from climate change. As discussed above, this implied advocacy for a specific policy is outside the purpose of this document and as such should be removed.</p>	Ch 3: Air Quality		89	36	<p>After consideration of this point, we still feel the existing text is clear, accurate, and does not advocate for any specific policy or “vehicle” for addressing climate impacts on health. It simply notes that the oft-used expression “climate penalty” has been coined to express this effect in the context of the NAAQS.</p>

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
howard	feldman	<p>“Climate change is expected to increase O3 pollution in the future over the United States, in part due to higher temperatures and more frequent stagnant air conditions (Jacob and Winner 2009). If these increases are not offset by additional emissions reductions, these climate-driven increases in ozone will cause premature deaths, hospital visits, lost school days, and acute respiratory symptoms.”</p> <p>The phrase “[i]f these increases are not offset by additional emissions reductions” implies a specific policy solution. As discussed above, this implied advocacy for a specific policy is inappropriate in this document.</p> <p>Recommendation</p> <p>Revise the above statement as such: “Assuming constant emissions levels, these climate-driven increases in ozone will cause premature deaths, hospital visits, lost school days, and acute respiratory symptoms.”</p>	Ch 3: Air Quality		91	1	After consideration of this point, we still feel the existing text is clear, accurate, and does not advocate for any specific policy. It simply notes that future ozone levels will be a function of both climate impacts and O3 precursor impacts.
howard	feldman	<p>“This climate penalty for ozone will offset some of the expected health benefits that would otherwise result from the expected ongoing reductions of ozone precursors.”</p> <p>Recent literature suggests that the change in ozone formation going into the future is much more sensitive to changes in emissions rather than changes in climate across much of the world (except Russia and Eastern Europe).</p>	Ch 3: Air Quality		91	30	Due to the size of the topic, and the page limit for the chapter, we focused on the climate impacts on health rather than providing such a level of specificity that compares those impacts to emissions-based impacts.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>Recommendation</p> <p>Adjust the sentence to contextualize the impacts of the so-called ‘climate penalty’ on ozone with the effects of emissions.</p> <p>References</p> <p>N.E. Selin, S. Wu, K.M. Nam, J.M. Reilly, S. Paltsev, R. Prinn and M.D. Webster. 2009. "Global health and economic impacts of future ozone pollution." Environmental Research Letters, 4, 044014, doi:10.1088/1748-9326/4/4/044014</p>					
howard	feldman	<p>“the size of the population exposed”</p> <p>Recommendation</p> <p>“the size and spatial distribution of the population exposed”</p>	Ch 3: Air Quality		92	10	The text has been revised to incorporate this suggestion.
howard	feldman	<p>“climate change will increase the frequency of weather patterns conducive to forming ground-level ozone”</p> <p>Recommendation</p>	Ch 3: Air Quality		92	20	The text has been revised to incorporate parts of this suggestion.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		“climate change may regionally increase the frequency of weather patterns conducive to forming ground-level ozone”					
howard	feldman	<p>“Unless offset by additional emissions reductions, this ‘climate penalty’ of increased ozone concentrations due to climate change would result in tens to thousands of additional ozone-related illnesses and premature deaths per year.”</p> <p>The phrase “[u]nless offset by additional emissions reductions” implies a specific policy solution. As discussed above, this implied advocacy for a specific policy is inappropriate in this document.</p> <p>Recommendation</p> <p>Revise the above statement as such: “Assuming constant emissions, this ‘climate penalty’ of increased ozone concentrations due to climate change would result in tens to thousands of additional ozone-related illnesses and premature deaths per year.”</p>	Ch 3: Air Quality		93	2	After consideration of this point, we still feel the existing text is clear, accurate, and does not advocate for any specific policy. It simply notes that increased ozone levels due to climate will have health impacts, unless the emissions-based impacts (which are not a subject of this report) offset them.
howard	feldman	<p>“Emissions of sulfur dioxide (SO₂) and NO_x are projected to decline substantially over the next few decades due to regulatory controls (EPA 1999; EPA 2011; EPA 2015), which will lead to reductions in sulfate and nitrate aerosols”</p> <p>Agree with this statement but think that it can be broadened to include black carbon as well. The recent EPA report on black carbon (2012) showed that the US will continue to have significant reductions in BC due to existing regulations coupled with fleet turnover in the transportation sector. Beyond these particular set of sentences, the only other mentions of black carbon are in the</p>	Ch 3: Air Quality		93	34	The text has been revised to incorporate this suggestion and the appropriate citation has been provided.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>context of wildfires which is very much outside the realm of opportunities for regulations to reduce emissions.</p> <p>Recommendation</p> <p>Adjust the sentence to reflect knowledge regarding black carbon emissions.</p> <p>Reference</p> <p>EPA, 2012, Report to congress on black carbon.</p>					
howard	feldman	<p>“The area burned by wildfires in North America is expected to increase dramatically over the 21st century due to climate change”</p> <p>Existing studies show significant regional variability in changes in wildfires due to climate change. For example, Pechony and Shindell show that wildfires in the Western US are anticipated to increase while wildfires in the Eastern US are anticipated to decrease under various end-of-century warming scenarios.</p> <p>Recommendation</p>	Ch 3: Air Quality		94	22	We appreciate this suggestion, but space is limited. The author team has deliberated and agreed on the most important information and illustrations to include. After consideration of this point, we still feel the existing text (which specifies North American wildfires) is clear and accurate.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>Adjust the sentence to better reflect the regional variability and uncertainty expressed in the literature.</p> <p>References</p> <p>O. Pechony and D.T. Shindell. 2010. "Driving forces of global wildfires over the past millennium and the forthcoming century" Proc Natl Acad Sci USA, doi: 10.1073/pnas.1003669107</p>					
howard	feldman	<p>Key Finding #1 is heavily based on data that suggests increases in ozone will exacerbate ozone health impacts, but this finding ignores the substantial uncertainty that exists regarding the health effects of ozone at current environmental levels. With a large body of toxicological data from humans and laboratory animal studies, a strong basis exists for how ozone may cause biological changes with relatively high, short-term exposures in excess of the current NAAQS. However, the health effects of ozone are dependent on the dose or exposure received over time. Therefore, generalized statements implying any increase in ozone over current levels will result in measurable effects are weak at best. In order to adequately address any health impacts arising from climate-induced ozone increases, it is important to define or predict the magnitude of the increase and the geographic or regionally predicted impacts. As described in more detail below, there is notable uncertainty surrounding the role of ozone at current levels in observed health effects. This uncertainty along with the uncertainty surrounding the magnitude and geographic distribution of increased ozone (i.e. levels above the current ozone NAAQS) as well as the mitigating efforts to decrease ozone should be recognized and factored into the overall confidence conclusion.</p> <p>However, In addition, a discussion around long-range transport of ozone and particulates, particularly in the conversation around a</p>	Ch 3: Air Quality		102		After consideration of this point, we feel that the data supporting ozone related health effects is clear and accurate.

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		climate penalty leading to increased difficulty in meeting NAAQS requirements was missing from Chapter 3. For example, Holloway (2003) and/or Zhang et al (2011) demonstrate that emissions from significant distances (particularly outside the US) can have consequences on local air quality and the ability to meet air quality standards.					
howard	feldman	<p>Short-term ozone exposure and respiratory morbidity</p> <p>Consistent with this report, EPA, in the 2014 Proposed Rule (PR) for ozone states that recent multi-city and single-city studies of short-term ozone exposures "continue to report associations" with hospital admissions (HAs) and emergency department (ED) visits for respiratory-related illness, and that children are at greatest risk for this outcome. EPA's Integrated Science Assessment cites three studies as evidence supporting 1) causal relationships between short-term exposure and respiratory morbidity, and 2) respiratory effects in children at ambient ozone concentrations near or below the current standard (Silverman and Ito, 2010; Strickland et al., 2010; Mar and Koenig, 2009). However, the results of these studies are inconsistent and may be affected by model selection bias or residual confounding.</p> <p>The shape of the concentration-response function (CRF) between short-term ozone exposure and asthma hospital admissions influences the results of risk assessment analyses used most recently by EPA to support the decision to lower the standard. However, interpretation of the CRF shape is limited by a lack of data in the low-dose region (i.e., around 0.030 ppm and below), as acknowledged in the PR (US EPA, 2014, p. 75258). In addition, these studies are affected by methodological limitations that are not considered by EPA when evaluating the evidence for a possible threshold.</p>	Ch 3: Air Quality		89	32	<p>The Integrated Science Assessment for ground-level ozone evaluated the available epidemiological, toxicological and controlled human exposure studies, and concluded that "The evidence for these health effects indicates that the relationship between concentration and response is linear along the range of O3 concentrations observed in the U.S., with no indication of a threshold within that range."</p> <p>EPA recognized the potential impact of publication bias on the conclusions that may be drawn from a body of studies, as indicated in the preamble of the ISA (see p. lix). Furthermore, EPA has repeatedly drawn upon the findings of several studies that assessed the potential for publication bias for O3-related health effects studies. As described in section 7.4.4 of the 2006 Criteria Document, two meta-analyses investigating the association between short-term exposure to O3 and mortality also examined the evidence for publication bias in the available literature. Bell et al. (2005) concluded that the results provided strong evidence of an association between O3 and mortality that was not sensitive to adjustment for PM or for model specifications.</p> <p>With respect to long-term ozone exposure and respiratory morbidity and mortality, the analysis does not consider this health endpoint.</p>

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		<p>Other health endpoints related to respiratory morbidity highlighted previously by EPA include lung function decrements, asthma symptoms, and medication use, as reported in longitudinal, repeated measures (i.e., "panel") studies, which have predominantly been conducted with cohorts of asthmatic children. Both older and more recent studies are limited by errors inherent in self-measured and self-reported health status, especially in pediatric subjects.</p> <p>Short-term ozone exposure and mortality</p> <p>Regarding short-term exposure and mortality, EPA has previously commented that new multi-city studies report consistent positive associations that strengthen the body of evidence. Specifically, EPA cites recent multi-city studies in the US (Zanobetti and Schwartz, 2008a), Europe (Samoli et al., 2009), Italy (Stafoggia et al., 2010), and Asia (Wong et al., 2010), as well as the multi-continent study by Katsouyanni et al. (2009), to support the conclusion that there is a causal relationship between short-term ozone exposure and respiratory effects, including respiratory mortality.</p> <p>Many of the short-term mortality studies published since the 2006 ozone Air Quality Criteria Document (AQCD) are re-analyses of existing multi-city datasets. The principal purpose of recent short-term studies was to address specific uncertainties associated with time-series epidemiology studies via extensive sensitivity analyses that determine the relative impact of uncertainties on effect estimates. These uncertainties include the choice of ozone averaging time, model selection (including choice of lag time), the confounding effects of co-pollutants and other factors (e.g., temperature), modifying effects that may explain the observed</p>					

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		<p>heterogeneity in mortality effect estimates across cities and regions, exposure measurement error, and the shape of the CRF. The new evidence only serves to further highlight these uncertainties.</p> <p>Long-term ozone exposure and respiratory morbidity</p> <p>In the 2006 ozone AQCD, EPA concluded that evidence was "suggestive but inconclusive for respiratory health effects from long-term O3 exposure" (US EPA, 2006). However, in the recent ISA, EPA concluded there is "likely to be a causal relationship," based largely on what it considered coherent new epidemiology evidence (US EPA, 2013). In the ozone PR, the Administrator maintains that the evidence for respiratory morbidity attributable to long-term ozone exposure "has been strengthened" (US EPA, 2014). However, neither the older evidence nor the more recent evidence is strong enough to support a "likely" causal association. For example, the ISA cites several studies from the Children's Health Study (CHS) that investigated whether relationships between ozone and asthma are modified by polymorphisms in genes associated with inflammatory and oxidative stress pathways, but the results of these studies are mixed and difficult to interpret (Islam et al., 2008, 2009; Salam et al., 2009). Also, new evidence supporting the hypothesis that long-term exposure to ozone increases risks of asthma-related HAs and ED visits is limited to one study (Meng et al., 2010) that reported some positive associations. A lack of consistent trends across increasing ozone exposures indicates that these could be spurious associations that may be due to chance or confounding.</p> <p>Long-term ozone exposure and mortality</p>					

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		<p>A limited number of epidemiology studies have reported findings bearing on the relationship between long-term exposure to ozone and mortality, as acknowledged by the Administrator in the ozone PR. Of the four additional studies published since the 2006 AQCD that were reviewed in the ISA, two reported no significant associations between long-term ozone exposures and all-cause or cause-specific mortality, including cardiopulmonary mortality (Jerrett et al., 2009; Zanobetti and Schwartz, 2011; Smith et al., 2009; Wang, 2009).</p> <p>Jerrett et al. (2009) is a re-analysis of the American Cancer Society (ACS) Cancer Prevention Study II cohort. This was the only recent study to report a positive association between long-term ozone exposure and respiratory-related mortality that was unaffected in the two-pollutant analysis with PM_{2.5} (fine particulate matter). Jerrett et al. (2009) analyzed air-quality data from 96 statistical areas in the United States and presented results for seven regions. They observed regional heterogeneity for the relative risk (RR) of respiratory mortality attributed to a 0.01 ppm increase in ambient ozone. These RRs ranged from 0.99 (95% CI: 0.92-1.07) in the northeast to 1.21 (95% CI: 1.04-1.40) in the southwest. In Southern California, where regional ozone concentrations were the highest, there was no association between ozone and respiratory mortality (RR =1.01; 95% CI: 0.96-1.07). Ozone is a single molecule (unlike PM, which can be comprised of many different components). Thus, variations in composition cannot account for the heterogeneity of results; rather, it is most likely attributable to unaccounted-for confounding.</p> <p>In addition, there is uncertainty about the shape of the CRF for long-term exposure and mortality derived from Jerrett et al. (2009) that has not been resolved. This is a major issue, because assumptions about the nature of the CRF have a large impact on risk calculations regarding the number of deaths attributable to long-term exposure. Specifically, Jerrett et al. (2009) calculated a</p>					

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		<p>0.056-ppm threshold for mortality. This threshold represents the average of each day's maximum one-hour ozone concentration between April and September. When the threshold is adjusted to the form of the NAAQS, for instance, EPA found that the number of predicted deaths was reduced by as much as 98%.</p> <p>Given the small number of studies, the limitations of these studies, and the inconsistent findings among them, the evidence linking long-term ozone exposure with mortality is insufficient and does not support a causal relationship between long-term exposure to ozone and mortality.</p> <p>Conclusion & Recommendation:</p> <p>The discussion presented in section 3.3 on climate impacts on outdoor air pollutants and health is highly generalized. Critical to determining the certainty (i.e. confidence) of the predictions is understanding the magnitude of the changes predicted and the extent of those changes, both geographically and over time, and with the consideration of future technological advances in emissions control. The literature cited throughout the chapter focuses heavily on epidemiology derived estimates of the health impacts of ozone at current or near-current day standards. EPA recently acknowledged less confidence in estimates of epidemiologic-based risks reflecting uncertainties associated with mortality and morbidity risk estimates, including the heterogeneity in effect estimates between epidemiologic study areas, the potential for epidemiologic-based exposure measurement error and uncertainty in the interpretation of the shape of the concentration-response functions (US EPA, 2014). EPA also expressed a reduced confidence in the results of the assessment of respiratory mortality risks associated with long term ozone exposures (US EPA, 2014). These determinations should be considered and discussed as part of</p>					

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		<p>the overall confidence conclusion that climate-driven increases in ozone will cause premature deaths, hospital visits, lost school days, and acute respiratory symptoms.</p> <p>References</p> <p>Islam, T; Berhane, K; McConnell, R; Gauderman, WJ; Avol, E; Peters, JM; Gilliland, FD. 2009. "Glutathione-S-transferase (GST) P1, GSTM1, exercise, ozone and asthma incidence in school children." Thorax 64(3):197-202.</p> <p>Islam, T; McConnell, R; Gauderman, WJ; Avol, E; Peters, JM; Gilliland, FD. 2008. "Ozone, oxidant defense genes, and risk of asthma during adolescence." Am. J. Respir. Crit. Care Med. 177(4):388-395.</p> <p>Jerrett, M; Burnett, RT; Pope, CA; Ito, K; Thurston, G; Krewski, D; Shi, Y; Calle, E; Thun, M. 2009. "Long-term ozone exposure and mortality." N. Engl. J. Med. 360(11):1085-1095.</p> <p>Katsouyanni, K; Samet, JM; Anderson, HR; Atkinson, R; Le Tertre, A; Medina, S; Samoli, E; Touloumi, G; Burnett, RT; Krewski, D; Ramsay, T; Dominici, F; Peng, RD; Schwartz, J; Zanobetti, A. October 29, 2009. "Air Pollution and Health: A European and North American Approach (APHENA)." HEI Research Report 142. 132p.</p>					

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		<p>Mar, TF; Koenig, JQ. 2009. "Relationship between visits to emergency departments for asthma and ozone exposure in greater Seattle, Washington." <i>Ann. Allergy Asthma Immunol.</i> 103:474-479.</p> <p>Meng YY; Rull, RP; Wilhelm, M; Lombardi, C; Balmes, J; Ritz, B. 2010. "Outdoor air pollution and uncontrolled asthma in the San Joaquin Valley, California." <i>J. Epidemiol. Community Health</i> 64(2):142-147.</p> <p>Salam, MT; Islam, T; Gauderman, WJ; Gilliland, FD. 2009. "Roles of arginase variants, atopy, and ozone in childhood asthma." <i>J. Allergy Clin. Immunol.</i> 123(3):596-602.</p> <p>Samoli, E; Zanobetti, A; Schwartz, J; Atkinson, R; LeTertre, A; Schnindler, C; Perez, L; Cadum, E; Pekkanen, J; Paldy, A; Touloumi, G; Katsouyanni, K. 2009. "The temporal pattern of mortality responses to ambient ozone in the APHEA project." <i>J. Epidemiol. Community Health</i> 63(12):960-966.</p> <p>Silverman, RA; Ito, K. 2010. "Age-related association of fine particles and ozone with severe acute asthma in New York City." <i>J. Allergy Clin. Immunol.</i> 125(2):367-373.</p>					

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		<p>Smith, RL; Xu, B; Switzer, P. 2009. "Reassessing the relationship between ozone and short-term mortality in U.S. urban communities." <i>Inhal. Toxicol.</i> 21(Suppl. 2):37-61.</p> <p>Stafoggia, M; Forastiere, F; Faustini, A; Biggeri, A; Bisanti, L; Cadum, E; Cernigliaro, A; Mallone, S; Pandolfi, P; Serinelli, M; Tessari, R; Vigotti, MA; Perucci, CA. 2010. "Susceptibility factors to ozone-related mortality: A population-based case-crossover analysis." <i>Am. J. Respir. Crit. Care Med.</i> 182(3):376-384.</p> <p>Strickland, MJ; Darrow, LA; Klein, M; Flanders, WD; Sarnat, JA; Waller, LA; Sarnat, SE; Mulholland, JA; Tolbert, PE. 2010. "Short-term associations between ambient air pollutants and pediatric asthma emergency department visits." <i>Am. J. Respir. Crit. Care Med.</i> 182(3):307-316.</p> <p>Wang, XY; Hu, W; Tong, S. 2009. "Long-term exposure to gaseous air pollutants and cardio-respiratory mortality in Brisbane, Australia." <i>Geospat. Health</i> 3(2):257-263.</p> <p>Wong, CM. 2010. "Public Health and Air Pollution in Asia (PAPA): A combined analysis of four studies of air pollution and mortality." HEI Research Report 154 Part 5. Public Health and Air Pollution in Asia (PAPA): Coordinated Studies of Short-Term Exposure to Air Pollution and Daily Mortality in Four Cities. Health Effects Institute, Boston, MA. p377-431., November. Accessed at http://pubs.healtheffects.org/getfile.php?u=595.</p>					

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		<p>Zanobetti, A; Schwartz, J. 2011. "Ozone and survival in four cohorts with potentially predisposing diseases." Am. J. Respir. Crit. Care Med. 184(7):836-841.</p> <p>Zanobetti, A; Schwartz, J. 2008a. "Mortality displacement in the association of ozone with mortality: An analysis of 48 cities in the United States." Am. J. Respir. Crit. Care Med. 177(2):184-189.</p> <p>US EPA. 2006. "Air Quality Criteria for Ozone and Related Photochemical Oxidants (Volume I of III)." National Center for Environmental Assessment-RTP Division. EPA 600/R-05/004aF. 821p., February.</p> <p>US EPA. 2013. "Integrated Science Assessment for Ozone and Related Photochemical Oxidants (Final)." National Center for Environmental Assessment (NCEA). EPA/600/R-10/076F. 1251p., February.</p> <p>US EPA. 2014. "National ambient air quality standards for ozone (Proposed rule)." 40 CFR Parts 50, 51, 52, 53 and 58. Accessed at http://epa.gov/glo/actions.html#nov2014.</p>					
howard	feldman	<p>Finding #2: Worsened Allergy and Asthma Conditions</p> <p>Changes in climate, specifically rising temperature, altered precipitation patterns, and increasing atmospheric carbon dioxide, are expected to contribute to increasing levels of some airborne allergens and associated increases in asthma episodes and other</p>	Ch 3: Air Quality		103	23	The comment is inconsistent with the current state of the science on this topic. The Kinney reference does not state that the link between climate, CO2 and aeroallergens is uncertain. Actually the evidence for an increased frequency and severity of allergenic responses due to increased number and duration of airborne allergens is highly certain.

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		<p>allergic illnesses, compared to a future without climate change. [High Confidence]</p> <p>Although Key finding #2 is titled “Worsened Allergy and Asthma Conditions, the Key Finding is actually focused on a strong link between meteorological events (e.g. rising temperature, altered precipitation, and increased CO2) and increased number and duration of airborne allergens. A confidence rating of “high confidence” may be supported by the underlying literature for a link between meteorological events and changes in airborne allergens. However, evidence for an increased frequency and severity of allergenic responses due to increased number and duration of airborne allergens is highly uncertain (Kinney, 2008). The report notes “a need for a better understanding of the role of climate change as it contributes to aeroallergen-related disease, especially asthma” as part of the major uncertainties. This data gap should be further addressed, and Key Finding #2 should be revised to focus solely on the certainty of climate-induced increases in number and duration of airborne allergens. Impacts on the prevalence and severity of allergic diseases are speculative given the lack of understanding of allergenic disease prevalence and exacerbation and therefore should not be associated with the “high confidence” rating of Key Finding #2.</p>					
howard	feldman	<p>The report also proposes a role for air pollution in allergenic disease. “In particular, pre-exposure to air pollution (especially ozone or fine particulate matter) may magnify the effects of aeroallergens, as prior damage to airways may increase the permeability of mucous membranes to the penetration of allergens (Cakmak et al., 2012).”</p> <p>This implies a role for short or long term air pollution exposure in allergenic disease. However, this statement is poorly supported as referenced. Even the authors of the cited report? acknowledge the lack of power in their study and lack of consistency between peak periods of air pollution and peak periods of allergens (Cakmak et</p>	Ch 3: Air Quality		96	23	<p>This section was revised to provide a caveat with respect to the effects of ozone exposure that may interact with ambient air pollution (especially ozone) per the findings of the USEPA study of ozone prepared for the review of the NAAQS ozone standards.</p> <p>With this caveat, we believe that the paragraph is now consistent with the current state of the science.</p>

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		<p>al., 2012). More extensive reviews of the role of air pollution in asthma prevalence and exacerbation are available and should be cited for completeness and data gaps and uncertainties should be highlighted. For example, in the recent ozone NAAQS review by EPA, the Administrator acknowledges there are inconsistencies across epidemiology, controlled human exposure, and toxicology studies. Indeed, the evidence is not coherent or consistent and does not demonstrate that asthmatics are at increased risk of effects from ambient ozone exposure compared to non-asthmatics (US EPA, 2014).</p> <p>References</p> <p>Cakmak, S; Dales, RE; Coates, F. 2012. Does air pollution increase the effect of aeroallergens on hospitalization for asthma? J. Allergy and Clin. Immun. 129: 228-231.</p> <p>Kinney, PL. 2008. Climate change, air quality, and human health. Amer. J. Preven. Med. 35:459-467.</p> <p>US EPA. 2014. "National ambient air quality standards for ozone (Proposed rule)." 40 CFR Parts 50, 51, 52, 53 and 58. Accessed at http://epa.gov/glo/actions.html#nov2014.</p>					
howard	feldman	<p>The report is at times selective in its use of supporting literature for some key findings. The authors appear to have chosen literature to cite because it seemingly supports an a priori ‘finding’ rather than deriving a finding from a systematic review of the literature. Also, assumptions are made regarding the precipitating weather-related events. In many situations, the degree of confidence in these assumptions is not stated. For scenarios that are themselves of low</p>	Ch 4: Vectorborne Diseases				<p>The approach and organization of each chapter was decided after conducting a comprehensive literature review based on scope, both of each chapter and of the report. Two case studies, Lyme disease and West Nile virus, were chosen as representative examples of vectorborne diseases in the US for this chapter due to their incidence and the body of literature</p>

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		or unknown confidence, ascribing high certainty to the subsequent health event predictions is not justified.					available. This chapter uses these two case studies to examine observed and projected impacts of climate change on human health.
howard	feldman	<p>Finding #1</p> <p>“Climate change is expected to alter the geographic and seasonal distributions of existing vectors and vectorborne diseases. [Likely, High Confidence]”</p> <p>We concur that these alterations in vector distribution will likely occur (with high confidence), but emphasize the high uncertainties in the various models when attempting to project climate-related health effects (Estrada-Peña, 2015). It is important to note, however, that natural climate change may be responsible for any alteration in disease vectors. The report does not establish that man-made climate change will be responsible for any alteration, and it should be revised to reflect this limitation and to accurately present the state of the science.</p>	Ch 4: Vectorborne Diseases		123	3	This chapter focusses on assessing the impacts of climate change on vectorborne diseases. It is outside the scope of this chapter and of the report to discuss the attribution of anthropogenic driven climate change verses the attribution of natural forcing on VBD.
howard	feldman	<p>“A substantial number of studies have been conducted to elucidate the role of climate in the transmission of these disease agents. The broad findings from these case studies are generalizable to other vector-borne diseases (Gage, 2008).”</p> <p>Authors of this chapter incorrectly cite Gage and colleagues as support for this statement. In this article, authors clearly state: “determining the effects of climate change on the incidence, spread, and geographic range of vectorborne diseases is challenging. Although past outbreaks have sometimes been associated with extreme climate events and climatic variability, confidence in using these studies for predicting future events is often low, or the results are contentious.” Authors continue on to highlight that “the lack of well-designed long-term studies makes it difficult to determine if observed changes in transmission and</p>	Ch 4: Vectorborne Diseases		126	2	The text has been modified slightly to address the concern. In other parts of this chapter, the issue of uncertainties is addressed very thoroughly and is consistent with the conclusions of Gage et al.

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		<p>distribution of vectorborne diseases are related to climate or to one or more of the many other global changes concurrently transforming the world, including increased economic globalization, the high speed of international travel and transport of commercial goods, increased population growth, urbanization, civil unrest, displaced refugee populations, water availability and management, and deforestation and other land-use changes” (Gage, 2008).</p> <p>Recommendation</p> <p>Authors should recognize the uncertainties in the various models and the complexity of factors impacting vectorborne disease when attempting to project climate-related scenarios. Authors should also exercise caution when extrapolating the results of single outbreaks to future climate related scenarios and accurately reflect the limitations of the science in this area in the report.</p> <p>References</p> <p>Estrada-Peña A, Estrada-Sánchez A, Estrada-Sánchez D. Methodological caveats in the environmental modelling and projections of climate niche for ticks, with examples for Ixodes ricinus (Ixodidae). Vet Parasitol. 2015 Feb28;208(1-2):14-25.</p> <p>Gage, K. L., T. R. Burkot, R. J. Eisen, and E. B. Hayes, 2008: Climate and vectorborne diseases. American Journal of Preventive Medicine, 35, 436-450, doi:10.1016/j.amepre.2008.08.</p>					

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howard	feldman	<p>Finding #2</p> <p>“Ticks capable of carrying the bacteria that cause Lyme disease and other pathogens will show earlier seasonal activity and a generally northward expansion in their habitat range in response to increasing temperatures associated with climate change [Likely, High Confidence]. Longer seasonal activity and expanding geographic range of these ticks may increase the risk of human exposure to ticks [Low Confidence].”</p> <p>The authors of this report attribute too high a confidence rating on the finding that ticks will show earlier seasonal activity and a generally northward expansion in their habitat in response to increasing temperatures associated with climate change. Predictions of future distributions vary widely with the models' assumptions, which are rarely tested against reasonable alternatives. These inconsistencies, limited data regarding key tick-demographic and climatic processes, and limited incorporation of non-climatic processes have weakened the application of research results to public health policy or actions (Ostfeld, 2015). Additionally, the discussion ignores some modeling exercises which forecast a contraction of tick habitat due to climate change (Boeckmann, 2014).</p> <p>Cases of Lyme disease, in the United States, as reported by the CDC, are heavily localized to the Northeast, in states such as Connecticut, Massachusetts, Pennsylvania, New York and New Jersey. However, over the course of 2004-2013, cases of this disease have been expanding geographically, both southward and westward. Most recent data shows an increase in cases of Lyme disease occurring in states such as Alabama, Arizona, California,</p>	Ch 4: Vectorborne Diseases		123	6	<p>The statement that ticks are likely to expand their range northward, does not negate the fact that they may also move in other directions. However, it is likely that climate is one of many variables limiting the tick’s distribution. The literature supports the assumption that minimum temperature is a limiting factor along the northern limits of the tick’s distribution and that is what we address here in our key finding. Regarding earlier onset of activity in relation to increasing temperatures, aside from a theoretical model (Ogden et al. 2009) proposing that increasing temperatures will accelerate the life cycle leading to nymphal host seeking in the fall, rather than the spring, nearly all empirical studies show earlier onset associated with higher temperatures (e.g., Eisen et al. 2002, 2003; Diuk-Wasser et al. 2006; Levi et al. 2015).</p> <p>We did not cite the Boeckmann and Joyner study (2014) because it addresses Ixodes ricinus in Europe. Our report focuses exclusively on the United States. However, the results of Boekman and Joyner (e.g., expansion to higher latitudes and elevations with contraction in the south) are similar to those reported by Brownstein et al. (2005) for I. scapularis. The Brownstein et al. (2005) study is cited in our report.</p>

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		<p>Texas, Florida, South Carolina, and Virginia (CDC, 2015). This is inconsistent with the conclusion presented in the draft report.</p> <p>Further, it is unreasonable to ascribe high confidence to a finding with a very large amount of uncertainty, as described in the references cited in this chapter. For example, Ashley and colleagues state: “climatic factors such as temperature, rainfall, and humidity are important in the presence or absence of the arthropod-borne diseases since variations in these entities may increase or decrease the longevity of the vector’s life span” (Ashley, 2004).</p> <p>Recommendation</p> <p>Authors should conduct a systematic literature review in order to objectively determine the likelihood and confidence in any climate related vector-borne disease associations.</p> <p>References</p> <p>Ashley, S. T., and V. Meentemeyer, 2004: Climatic analysis of Lyme disease in the United States. <i>Climate Research</i>, 27, 177-187, doi:10.3354/cr027177.</p>					

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		<p>Boeckmann M, Joyner TA. Old health risks in new places? An ecological niche model for I. ricinus tick distribution in Europe under a changing climate. Health Place. 2014 Nov;30:70-7.</p> <p>CDC. Reported cases of Lyme disease by state or locality, 2004-2013. Centers for Disease Control and Prevention. 2015. Available at: http://www.cdc.gov/lyme/stats/chartstables/reportedcases_statelocality.html</p> <p>Ostfeld RS, Brunner JL. Climate change and Ixodes tick-borne diseases of humans. Philos Trans R Soc Lond B Biol Sci. 2015 Apr 5;370(1665).</p>					
howard	feldman	<p>Finding #3 “Rising temperatures, changing precipitation patterns, and a higher frequency of some extreme weather events associated with climate change will influence the distribution, abundance, and infection rate of mosquitoes that transmit West Nile virus and other pathogens by altering habitat availability and mosquito and viral reproduction rates [Extremely Likely, High Confidence]. Alterations in the distribution, abundance, and infection rate of mosquitoes may increase human exposure to bites from infected mosquitoes, which may increase risk for human disease [Low Confidence].”</p> <p>We concur with the first statement in finding #3 and the stated level of confidence , although the report fails to explain that these effects may or may not be the result of man-made climate change. However, there are many variable factors affecting the direction of transmission capacity. For example, in the IPCC AR-5, Chapter 11, authors state that “ If climate change continues as projected across the Representative Concentration Pathway (RCP) scenarios, the major changes in ill health compared to no climate change will</p>	Ch 4: Vectorborne Diseases		123	12	<p>This chapter focusses on assessing the impacts of climate change on vectorborne diseases. It is outside the scope of this chapter and of the report to discuss:</p> <ol style="list-style-type: none"> 1. The attribution of anthropogenic driven climate change versus the attribution of natural forcing on VBD; and 2. A detailed discussion of mitigation, adaptation, and prevention methods. <p>Please see the Populations of Concern section for a brief discussion of activities that may reduce vulnerability to VBD.</p>

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		<p>occur through reduced capacity of disease-carrying vectors due to exceedance of thermal thresholds” (IPCC, 2014)</p> <p>Gubler and colleagues noted that “In the United States, changes in lifestyles and living conditions were major factors in the disappearance of malaria, dengue, and other mosquito-borne diseases. Unless living standards deteriorate drastically, such factors will remain dominant. In many regions, summer temperatures are higher than in much of the tropics where the diseases remain common. If the present warming trend continues, strategies to avoid these temperatures—particularly indoor living and air conditioning—are likely to become more prevalent. Consequently, the proneness to epidemics, already very low, will continue to decline” (Gubler, 2001). It is incorrect of the authors of this chapter to conclude that there may be increased risk of disease from mosquito-borne infections, without considering adaptive and mitigating measures likely to occur along with a changing climate.</p> <p>Recommendation</p> <p>Authors should objectively assess the risk of vector-borne diseases in the context of a changing climate.</p> <p>References</p> <p>Gubler, D. J., P. Reiter, K. L. Ebi, W. Yap, R. Nasci, and J. A. Patz, 2001: Climate Variability and Change in the United States:</p>					

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		<p>Potential Impacts on Vector- and Rodent-Borne Diseases. Environmental Health Perspectives, 109, 223-233, doi:10.2307/34</p> <p>IPCC, 2014: Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, 1132 pp. [Available online at http://www.ipcc.ch/report/ar5/wg2/]</p>					
howard	feldman	<p>Finding #4</p> <p>“Non-climate factors that affect vulnerability to vectorborne disease (such as age, gender, socioeconomic status, geography, and occupation) also influence risk for disease occurrence. [High Confidence]”</p> <p>This statement is poorly supported and confusing. The terms vulnerability and risk seem interchangeable in this context despite differing definitions. Vulnerability is defined by the IPCC as the propensity or predisposition to be adversely affected; risk is defined as the probability that an event will occur. Affect vulnerability to disease is synonymous with influence risk for disease as the terms are used here. The major uncertainties are acknowledged, and they would seem to significantly lower the stated “high” confidence in this key finding.</p> <p>Recommendation</p>	Ch 4: Vectorborne Diseases		123	20	<p>The approach and organization of each chapter was decided after conducting a comprehensive literature review based on scope, both of each chapter and of the report. Two case studies, Lyme disease and West Nile virus, were chosen as representative examples of VBD in the US for this chapter due to their incidence and the body of literature available. This chapter uses these two case studies to examine observed and projected impacts of climate change on human health.</p> <p>After consideration of this point, authors feel the confidence rating is appropriate; authors are confident that non-climate factors also influence risk for vectorborne disease occurrence. However, the text has been revised and the key finding has been deleted due to the fact that this finding is not specific to only vectorborne disease.</p>

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		Authors should reassess this finding and the given confidence rating, in an objective manner by utilizing a systematic review of the literature.					
howard	feldman	<p>Finding #5</p> <p>“Climate change will interact with other driving factors (such as travel-related exposures or evolutionary adaptation of invasive vectors and pathogens) to influence the emergence or re-emergence of vectorborne pathogens. [High Confidence]”</p> <p>We concur with this statement and the stated level of confidence.</p>	Ch 4: Vectorborne Diseases		123	24	We greatly appreciate your positive comment.
howard	feldman	The report is selective in its use of supporting literature for most key findings. The cited literature is seemingly chosen for supporting an a priori ‘finding’ rather than deriving a finding from a systematic review of the literature. Authors selectively cite literature both within studies cited and among all available literature on the subject. Objective consideration of the uncertainties in these findings is warranted.	Ch 5: Water-Related Illness				We disagree with the commenter’s characterization. The author team has deliberated and agreed on the most important information and illustrations to include, considering and presenting a comprehensive set of available peer-reviewed published information on water-related illness and climate change. The chapter discusses uncertainties as reflected in the literature. No change has been made to the text.
howard	feldman	<p>Finding #1</p> <p>“Increases in both coastal and inland water temperatures associated with climate change will expand the seasonal windows of growth [Very Likely, High Confidence] and the geographic range of suitable habitat [Likely, High Confidence] for naturally occurring pathogens and toxin-producing harmful algae. These changes are projected to increase the risk of exposure to waterborne pathogens</p>	Ch 5: Water-Related Illness		163	3	The Climate and Health Assessment is based upon a variety of sources. All sources were assessed to meet the guidance to authors. The author team has deliberated and agreed on the most important information and illustrations to include in this chapter to reflect the body of literature available for impacts within the US. After consideration of this point, we still feel the existing text is accurate, but it has been revised for additional clarity.

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		<p>and algal toxins that can cause a variety of illnesses [Medium Confidence].”</p> <p>This finding was incorrectly given a very likely and high confidence rating. Review of the cited references revealed significant uncertainties regarding how climate change will in fact affect the seasonal windows of growth and the geographic range of suitable habitat for naturally occurring pathogens and toxin-producing harmful algae. Further, authors selectively cited literature both within the studies cited and among all available literature on the subject. It is highly recommended that authors conduct an objective systematic review of the scientific literature to avoid misinformation. Specific examples of such selectivity are listed below.</p>					
howard	feldman	<p>“Most harmful algae, including freshwater cyanobacteria that can contaminate drinking water and marine dinoflagellate and diatom species that can contaminate fish and shellfish with natural toxins, thrive in warm water. As the climate continues to warm, water temperatures will rise above thresholds that promote bloom development earlier in the spring and will persist longer into the fall and expand into higher latitudes. This will result in a longer seasonal window and geographic range for human exposure, especially reaching higher latitudes (Peeters et al. 2007; Suikkanen et al. 2007; Wiedner et al. 2007; Wagner and Adrian 2009; Vincent and Quesada 2012; Anderson et al. 2012; Fu et al. 2012; Moore et al. 2008; Hallegraeff 2010; Backer and Moore 2012; Laws 2007).”</p> <p>The report misleads its readers by stating that warmer waters are more likely to be problematic or lead to negative health outcomes. For example, the best-know paralytic shellfish poison, Saxitoxin, gets its name from the clam it was first isolated from - the Alaskan Butter clam <i>Saxitoma gigantea</i> (Schantz, 1957); it is actually produced by a range of dinoflagellates and cyanobacteria. It is certainly not restricted to warm waters, indeed the first cases now thought to be due to this toxin were reported by European travelers</p>	Ch 5: Water-Related Illness		180	32	The Climate and Health Assessment is based upon a variety of sources. All sources were assessed to meet the guidance to authors. The author team has deliberated and agreed on the most important information and illustrations to include in this chapter to reflect the body of literature available for impacts within the US. After consideration of this point, we still feel the existing text is accurate, but the chapter has been revised in some places for additional clarity.

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		<p>to the Pacific Northwest in 1793 (Faber, 2012). Moreover, there is an active monitoring program for all commercial shellfish in the United States (Hollingworth, 1990). Similarly, domoic acid, now recognized as the toxin of amnesic shellfish poisoning, was first isolated from Prince Edward Island, Canada (Teitelbaum, 1990). Again there is an active monitoring program (Traynor, 2006).</p> <p>At least two shellfish toxins of greatest concern were actually first identified in much colder water than most of the US experiences. Further, there is an active monitoring program that seems to be protecting the public well, and which should have little trouble identifying any trends of increase.</p> <p>Moreover, references cited by the authors, call into serious question the authors' high confidence in their findings. For example, Moore and colleagues clearly state: "it is extremely difficult to separate the influence of climate change (natural and anthropogenic) from other anthropogenic impacts that are known to contribute to HABs using the limited datasets that are currently available... Predicted rising water temperature may therefore promote earlier and longer lasting HABs; however, it is important to acknowledge that interactions with other physical and biological aspects of the marine ecosystem will also influence the ultimate growth responses of HA species" (Moore, 2008).</p> <p>In another reference, Backer and Moore state that they merely "speculate on the potential synergies among climate change impacts and other factors; however, there is little direct evidence to support these ideas." Authors go on to state that "the lack of robust present-day predictive models for HABs [harmful algal blooms] has hindered our ability to accurately predict their potential impacts under future climate scenarios" (Backer and Moore, 2012).</p>					

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		<p>Recommendation</p> <p>Authors should objectively delineate the parameters influencing algal toxin blooms, with specific regard to the major uncertainties highlighted in the authors' citations.</p> <p>References</p> <p>Backer, L. C., and S. K. Moore, 2012: Harmful algal blooms: Future threats in a warmer world. Environmental Pollution and its Relation to Climate Change, A. E. Nemr, Ed., Nova Science Publishers, 485-512.</p> <p>Faber, Samantha. "Saxitoxin and the induction of paralytic shellfish poisoning." Journal of Young Investigators 23, no. 1 (2012): 1-7.</p> <p>Hollingworth, T., and M. M. Wekell. "Paralytic shellfish poison. Biological method. Final action." Official Methods of Analysis (1990): 881-882.</p> <p>Moore, S. K., V. L. Trainer, N. J. Mantua, M. S. Parker, E. A. Laws, L. C. Backer, and L. E. Fleming, 2008: Impacts of climate variability and future climate change on harmful algal blooms and</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>human health. Environmental Health, 7, 1-12, doi:10.1186/1476-069X-7-S2-S4.</p> <p>Schantz, Edward J., James D. Mold, D. Warren Stanger, John Shavel, Frank J. Riel, John P. Bowden, Joseph M. Lynch, Ruth Savage Wyler, Byron Riegel, and Hermann Sommer. "Paralytic shellfish poison. VI. A procedure for the isolation and purification of the poison from toxic clam and mussel tissues." Journal of the American Chemical Society 79, no. 19 (1957): 5230-5235.</p> <p>Teitelbaum, Jeanne S., Robert J. Zatorre, Stirling Carpenter, Daniel Gendron, Alan C. Evans, Albert Gjedde, and Neil R. Cashman. "Neurologic sequelae of domoic acid intoxication due to the ingestion of contaminated mussels." New England Journal of Medicine 322, no. 25 (1990): 1781-1787.</p> <p>Traynor, Imelda M., Laura Plumpton, Terence L. Fodey, Cowan Higgins, and Christopher T. Elliott. "Immunobiosensor detection of domoic acid as a screening test in bivalve molluscs: comparison with liquid chromatography-based analysis." Journal of AOAC International 89, no. 3 (2006): 868-872.</p>					
howard	feldman	<p>Finding #2</p> <p>"Recreational waters and sources of drinking water will be compromised by increasingly frequent and intense extreme precipitation events [High Confidence]. Surface runoff and flooding associated with heavy precipitation and storm surge events increase pathogen loads originating from urban, agricultural, and wildlife sources and promote blooms of harmful algae in both fresh and marine waters. Greater pathogen or algal toxin loading in drinking and recreational water sources following</p>	Ch 5: Water-Related Illness		163	10	The Climate and Health Assessment is based upon a variety of sources. All sources were assessed to meet the guidance to authors. The author team has deliberated and agreed on the most important information and illustrations to include in this chapter to reflect the body of literature available for impacts within the US. After consideration of this point, we still feel the existing text of Key Finding #2 is accurate, but it has been revised for additional clarity and to better reflect the supporting literature.

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		<p>an extreme weather event will increase risk of human exposure to agents of water-related illness [Medium Confidence].”</p> <p>Again, this finding was incorrectly given high and medium confidence ratings. Review of the cited references revealed significant uncertainties regarding how climate change will in fact affect recreational waters and sources of drinking water. Further, authors fail to acknowledge the ability of alternate factors to either propagate? or mitigate the contamination of water. In addition, authors selectively cited literature both within the studies cited and among all available literature on the subject. It is highly recommended that authors conduct an objective systematic review of the scientific literature to avoid misinformation, based on personal biases. Specific examples of such selectivity are listed below.</p>					
howard	feldman	<p>“These projected climate changes will contribute to contamination of drinking water sources and may increase human exposure to agents of water-related illness (Patz et al. 2008; Whitehead et al. 2009; Delpla et al. 2009; Sterk et al. 2013; Cann et al. 2013; Schijven et al. 2013; Smith et al. 2015).”</p>	Ch 5: Water-Related Illness		169	15	No changes were made as the commenter did not provide a suggested revision.
howard	feldman	<p>“Increased frequency of extreme weather events are projected for many regions in the United States as climate changes. Increased runoff and flooding events are expected to increase contamination of source waters (for drinking water supply) and surface waters used for recreation, which may increase people’s exposure to pathogens and toxins that cause illness (Cann et al. 2013; McLellan et al. 2007; Perry et al. 2012; Whitehead et al. 2009; Delpla et al. 2009; Patz et al. 2008; Sterk et al. 2013; Schijven et al. 2013; Smith et al. 2015; Corsi et al. 2014; Duris et al. 2013; Haley et al. 2009; Staley et al. 2012; McBride et al. 2013).”</p> <p>Authors of this chapter cite multiple sources of evidence for their hypothesis that projected climate changes will contribute to contamination of drinking water. However, authors appear to selectively disregard key parameters, delineated within cited</p>	Ch 5: Water-Related Illness		182	26	Due to the size of the topic, and the page limit for the chapter, we focused on broad trends rather than delving too deeply or providing such a level of specificity. The author team has deliberated and agreed on the most important information and illustrations to include in this chapter to reflect the body of literature available for impacts within the US. After consideration of this point, we still feel the existing text is accurate, but it has been revised for additional clarity.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>references, which are highly relevant to the elucidation of the authors' hypothesis. For example, Sterk and colleagues clearly highlight the importance of integrating pathogen behavior with information from disease outbreaks when assessing the implications of climate change. They state "heavy rainfall and subsequent runoff can affect the risk of waterborne disease outbreaks and it is therefore plausible to assume that increased precipitation will favor pathogen transport through runoff. However, other changes induced by climate change may cancel out such effects. For example, changes in the timing of manure application to soil and subsequent rain event could decrease pathogen input by increasing the period of die-off on land surfaces." In another example authors state "A clear example of counteracting effects of climate change effects: Summer droughts are lowering river discharges and could increase infection risks due to decreased dilution, but they could also decrease infection risks due increased inactivation of pathogens by increased temperatures and residence time" (Sterk, 2013).</p> <p>The study by Cann and colleagues, cited by authors of this report provide this cautionary statement regarding the available literature and the findings of their analysis: "Details of the extreme water-related weather events thought to be involved in the outbreaks, such as the amount of precipitation seen or parameters such as water temperature, pH and level of turbidity, were rarely given. This severely limits the suitability of the results for extrapolation to different circumstances and geographical locations" (Cann, 2012).</p> <p>Recommendation</p> <p>Authors should objectively examine any and all parameters affecting the contamination of drinking water sources.</p>					

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		<p>References</p> <p>Cann, K. F., D. R. Thomas, R. L. Salmon, A. P. Wyn-Jones, and D. Kay, 2013: Extreme water related weather events and waterborne disease. <i>Epidemiology and Infection</i>, 141, 671-86, doi:10.1017/s0950268812001653.</p> <p>Sterk, A., J. Schijven, T. de Nijs, and A. M. de Roda Husman, 2013: Direct and indirect effects of climate change on the risk of infection by water-transmitted pathogens. <i>Environmental Science & Technology</i>, 47, 12648-12660, doi:10.1021/es403549s.</p>					
howard	feldman	<p>Finding #3</p> <p>“Increases in some extreme weather events and storm surge will increase the risk of failure of, or damage to, water infrastructure for drinking water, wastewater, and storm water [Medium Confidence]. Aging infrastructure is particularly susceptible to failure. A breakdown in water infrastructure would contribute to increased risk of exposure to water-related pathogens, chemicals, and algal toxins.”</p> <p>Authors correctly identify the potential risk of failure of, or damage to, water infrastructure for drinking water, wastewater, and storm water, due to extreme weather related events. However, authors fail to acknowledge the ability of alternate factors to either promulgate or mitigate the contamination of water.</p>	Ch 5: Water-Related Illness		163	18	The text of Key Finding 3 has been revised for clarity based on other comments in the chapter and to better reflect the supporting literature. The chapter text has been revised to incorporate additional details as suggested. Consideration of human adaptive capacity as related to drinking water treatment has been included as appropriate to assess projected climate impacts on human health.

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		<p>As the authors note, while the relationship between extreme weather events, flooding, and contamination of drinking water is established, various causes of the contamination are detailed – outlining a complex scenario. They are correct in assigning water infrastructure a medium certainty; while the certainty of failures of aging infrastructure itself is well established (Beach et al., 2009), the degree to which climate change will influence the underlying causes of drinking water contamination in distributed systems – including treatment system integrity, operation and effectiveness (Beach et al., 2009; Zamyadi et al., 2012) -- is far less so.</p> <p>Important to note is there are regulations and monitoring systems in place to ensure drinking water quality (EPA’s Surface Water Rule (EPA cited 2015a) and Groundwater Rule (EPA cited 2015b)), which, where completely implemented, mitigate many of the contamination risks of distributed and private water systems. The authors correctly note that if drinking water is appropriately treated, climate change is not expected to substantially increase the risk of contracting a water-related illness. Treatment effectiveness may be affected by climate-related changes in distribution of pathogens (e.g., Zamyadi et al., 2012 found wild populations of cyanobacteria from blooms to be less sensitive to chlorination than lab-cultured cells), so treatment approaches may need to be revised.</p> <p>Wastewater disposal infrastructure is similarly regulated, robustly designed, stressed by weather events, and aging/failing. Improper wastewater disposal also contributes to the risks of drinking water and recreational water contamination, though the noted relationship between increased pathogen outbreaks following high rainfall events is not clearly linked to frequency or magnitude of bypass events for sewage treatment plants or combined sewer overflows. In fact, the narrative in the report appears to support wash-in (to surface water) and infiltration (to groundwater) of surface sources of pathogens as the principal cause(s) of drinking water illness.</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
howard	feldman	“This established relationship suggests that extreme precipitation is a key climate factor for water-related illness (Jofre et al. 2010; Auld et al. 2004; Salvadori et al. 2009; Fong et al. 2007).	Ch 5: Water-Related Illness		168	16	No changes were made because no revisions were requested.
howard	feldman	<p>“For example, in May 2000, following heavy rains, livestock waste containing E. coli O157:H7 and Campylobacter was carried in runoff to a drinking water well that served as the primary drinking water source for the town of Walkerton, Ontario, Canada, resulting in 2,300 illnesses and seven deaths (Auld et al. 2004; Clark et al. 2003, Salvadori et al. 2009).”</p> <p>Salvadori and colleagues clearly state in their publication that the water-related illness reported resulted largely from fraudulent practices, human error, lax regulations, budgetary cuts, and lack of worker training: “An unfortunate set of largely preventable circumstances culminated in disaster... In all work that deals with human safety, experience is important but formal training is fundamental. Legally binding regulations are more effective than voluntary guidelines.” Further, authors state: “The culture of fraudulence at the PUC included a host of improper operating practices, such as misrepresenting locations at which samples were taken, operating wells without chlorination, making false entries into daily operating sheets, failing to monitor daily chlorine residuals, inadequate chlorination, and submitting false annual reports to the MOE. The two men who ran the PUC had been grandfathered into their positions and lacked formal training. They had little understanding of how chlorination worked, or of the health risks associated with improper treatment and monitoring.” (Salvadori, 2009)</p> <p>Cann and colleagues state in their article that “well-managed public water supply systems are expected to be able to cope with weather extremes, such extremes can cause both physical and managerial stresses which may impact water quality.” Authors further state “outbreaks following natural disasters have previously</p>	Ch 5: Water-Related Illness		168	29	The text has been revised to clarify the synergy between human error and extreme precipitation as contributing factors to the Walkerton event.

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		<p>been found to be higher in developing countries than in industrialized countries... Flooding events, for example, in high-income countries are rarely thought to result in epidemics of infectious disease or, where they do occur, they are thought to often be easily controlled and not widespread due to the rapid implementation of preventative measures” (Cann, 2012).</p> <p>Recommendation</p> <p>Authors should objectively cite literature and conduct a thorough, unbiased, systematic review of the literature in order to accurately assess risk. Further, authors of this US based report should, focus on studies conducted in the US, as it is very difficult to extrapolate accurately, potential effects of failing infrastructure in developing nations, to infrastructure integrity and management here in the US.</p> <p>References</p> <p>Beach, M. J., S. Roy, J. Brunkard, J. Yoder, and M. C. Hlavsa, 2009: Vulnerable Infrastructure and Waterborne Disease Risk. Global Issues in Water, Sanitation, and Health: Workshop Summary, National Research Council, Ed., The National Academies Press, 159-169. [Available online at http://www.nap.edu/catalog/12658/global-issues-in-water-sanitation-andhealth-workshop-summary]</p> <p>Cann, K. F., D. R. Thomas, R. L. Salmon, A. P. Wyn-Jones, and D. Kay, 2013: Extreme water related weather events and waterborne</p>					

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		<p>disease. <i>Epidemiology and Infection</i>, 141, 671-86, doi:10.1017/s0950268812001653.</p> <p>EPA, cited 2015a: Private Drinking Water Wells. U.S. Environmental Protection Agency. [Available online at http://water.epa.gov/drink/info/well/index.cfm]</p> <p>EPA, cited 2015b: Public Drinking Water Systems Programs: Overview. U.S. Environmental Protection Agency. [Available online at http://water.epa.gov/infrastructure/drinkingwater/pws/index.cfm]</p> <p>Salvadori, M. I., J. M. Sontrop, A. X. Garg, L. M. Moist, R. S. Suri, and W. F. Clark, 2009: Factors that led to the Walkerton tragedy. <i>Kidney International</i>, 75, S33-S34, doi:10.1038/ki.2008.616.</p> <p>Zamyadi, A., S. L. MacLeod, Y. Fan, N. McQuaid, S. Dorner, S. Sauvé, and M. Prévost, 2012: Toxic cyanobacterial breakthrough and accumulation in a drinking water plant: A monitoring and treatment challenge. <i>Water Research</i>, 46, 1511-1523, doi:http://dx.doi.org/10.1016/j.watres.2011.11.012. [Available online at http://www.sciencedirect.com/science/article/pii/S0043135411006841]</p>					
howard	feldman	<p>Overall, the conclusions presented in Chapter 6 are imbalanced and do not discuss the large degree of uncertainty present in the literature. Chapter 6 focuses on the negative consequences of climate change instead of presenting all the conclusions, positive and negative, reported in the literature. For example, Kim et. al 2014 (cited) reports E.coli is the most sensitive to increased</p>	Ch 6: Food Safety				<p>The chapter explicitly demonstrates that not all pathogens respond in the same way to climate change (see Table 1 and Figure 3). However, text has been added to the pathogen section of this chapter to specifically describe climate impacts on norovirus and to elucidate that the</p>

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>temperature and humidity and speculates an increase in E.coli outbreaks will occur as a result of climate change. However, Kim et. al 2014 also reports norovirus outbreaks are highly correlated to colder and drier temperatures; climate change may lead to a decrease in norovirus cases. Since “human noroviruses are known to be the most common viral pathogen responsible for foodborne disease outbreaks...” even a small change in the transmission of this disease could lead to a reduction in overall food poisoning cases. This point is illustrated in Table 1 (“Climate change will not affect all foodborne pathogens equally...”); 71% of foodborne illnesses are caused by norovirus and a reduction in this incidence rate could lead to a dramatic reduction in overall foodborne illnesses. A robust discussion of the full conclusions of the literature and a discussion of the uncertainty of the projections, would assist readers to assess the potential threat climate change may have on food safety.</p> <p>In order to clarify the Key Findings to the reader, each should completely describe the potential chain of events that may lead to adverse human health effects. Separate findings for each piece of the causal chain could include: 1) environment, 2) intermediary for potential human effect [environmental stressor], 3) potential for adverse human health outcome.</p>					<p>impacts of climate change on norovirus are unclear due to contrasting climate aspects. That is, potential improvements in health outcomes (fewer cases in winter) are possible with warming temperatures; but that worsening health outcomes are also possible due to elevated transmission of norovirus during floods. This additional text has been added to improve clarity, and outline uncertainties regarding future climate projections on norovirus transmission and incidence. Similarly, the chapter text has been revised to note that in some cases, it is not clear whether the impact of climate change on a pathogen will be positive or negative (for example, see the section on drought, which can reduce water quality, increase runoff, and increase pathogen concentration, but can also decrease the survivability of certain foodborne pathogens). Likelihood statements in the findings, and the process by which that likelihood was assigned, is described in the traceable accounts section, which highlights the literature and chain of events leading to the key conclusions. The section on Major Uncertainties of the traceable account for Key Finding #1 has been revised to include these examples of uncertainty in the positive versus negative direction of health impacts on certain pathogens.</p>
howard	feldman	<p>Key Finding 1 - Traceable Accounts</p> <p>“Although there are many practices to safeguard food in the United States, climate change, including rising temperatures and changes in weather extremes, is expected to intensify pathogen and toxin exposure [Likely, High Confidence], increasing the risk, if not the actual incidence, of foodborne illnesses [Medium Confidence].”</p>	Ch 6: Food Safety		226	17	<p>The Key Finding and traceable accounts have been revised, with particular attention paid to delineating the confidence levels at different stages, and including adaptive capacity.</p>

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		<p>This Key Finding does not completely describe the potential chain of events that may affect human health. Recommend separate findings for climate changes to: 1) environment, 2) intermediary for potential human effect [environmental stressor], 3) potential for adverse human health outcome.</p> <p>Recommendation</p> <p>Consider rewording for clarification. Suggest the following edits:</p> <p>Although there are many practices and regulations to safeguard food in the United States, climate change, including rising temperatures and changes in weather extremes, is expected to intensify alter the distribution of pathogens [Likely, High Confidence] and toxin biocide use [Likely, High Confidence] that will increase the potential for exposure [some confidence finding]. These changes will increase the risk, if not the actual incidence, of foodborne illnesses [Medium Confidence].</p>					
howard	feldman	<p>Key Finding 1 - Traceable Accounts</p> <p>“Although there are many practices to safeguard food in the United States, climate change, including rising temperatures and changes in weather extremes, is expected to intensify pathogen and toxin exposure [Likely, High Confidence], increasing the risk, if not the actual incidence, of foodborne illnesses [Medium Confidence].</p>	Ch 6: Food Safety		226	19	The Key Finding and traceable accounts have been revised, with particular attention paid to delineating the confidence levels.

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		Recommend separating pathogen exposure from toxicant exposure, unless the authors mean pathogen toxin exposure.					
howard	feldman	<p>Key Finding 1 - Traceable Accounts</p> <p>“Although there are many practices to safeguard food in the United States, climate change, including rising temperatures and changes in weather extremes, is expected to intensify pathogen and toxin exposure [Likely, High Confidence], increasing the risk, if not the actual incidence, of foodborne illnesses [Medium Confidence].”</p> <p>Not all microbial foodborne illnesses increase with ambient temperature; norovirus is the most prevalent foodborne illness and it prefers cooler temperatures. A small reduction in norovirus cases (millions of cases) could reduce overall foodborne illness and decrease pathogen and toxin exposure even if warm temperature pathogens increase. Detailed comments and citations are provided in the appropriate chapter section.</p>	Ch 6: Food Safety		226	22	The Key Finding and traceable accounts have been revised, with particular attention paid to delineating the confidence levels at different stages. In the chapter text, table 1, and figure 3 we acknowledge that rising temperatures do not affect all pathogens equally; however, the statement that temperatures and weather extremes will intensify pathogen and toxin exposure is accurate. For example, norovirus outbreaks are also associated with precipitation extremes, even in warm regions like Australia. Text has been added to the pathogen section of this chapter to clarify climate impacts on norovirus due to both potential improvements in health outcomes (fewer cases in winter) and worsening health outcomes (elevated transmission during floods). This additional text was added to improve clarity, and outline uncertainties for this specific pathogen. These uncertainties have also been added to the Traceable Account section on Major Uncertainties for Key Finding 1.
howard	feldman	<p>Key Finding 2 - Traceable Accounts</p> <p>“Elevated sea surface temperatures and increases in certain weather extremes associated with climate change will increase human exposure to water contaminants in food [Likely, Medium Confidence]. Climate change will also alter the incidence and distribution of pests, parasites, and microbes [Very Likely, High Confidence], which will lead to increases in the use of pesticides for crop protection, animal agriculture, and aquaculture. Increased use of pesticides may result in increased human exposure to chemical contaminants in the food chain [High Confidence].”</p>	Ch 6: Food Safety		227	15	The author team has deliberated and agreed that there is sufficient peer-reviewed evidence in the literature that while not all pests, parasites and microbes will increase with climate change, sufficient numbers are increasing such that the statement regarding pesticide use is justified. The author team did not find any citations showing a decrease in agricultural pests with climate change. The traceable accounts section for Key Finding #2 notes the varying levels of likelihood and confidence in the links between rising CO2/ climate change and altered pest incidence and distribution; between these changes in incidence/ distribution and an expected

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>The literature cited by the authors does not only describe a unidirectional change in pest, parasite, and microbe occurrence (e.g. that there will be an increase in all three variables). The outlook is more complicated and nuanced than described in the draft document. Climate change is likely to alter the distribution etc. of these pests, but a change in distribution does not necessarily mean an increase in pesticides will be use. Detailed comments and citations are provided in the appropriate chapter section.</p> <p>Recommendation</p> <p>Authors should reevaluate the literature and assign a confidence level to the change in pesticides for crop protection, animal agriculture, and aquaculture.</p>					<p>increase in chemical management; and between these increases in pesticide use and the specific consequences on human health in the Unites States. The text and the traceable accounts section documents the uncertainties that play a role in these findings.</p>
howard	feldman	<p>Key Finding 2 - Traceable Accounts</p> <p>“Elevated sea surface temperatures and increases in certain weather extremes associated with climate change will increase human exposure to water contaminants in food [Likely, Medium Confidence]. Climate change will also alter the incidence and distribution of pests, parasites, and microbes [Very Likely, High Confidence], which will lead to increases in the use of pesticides for crop protection, animal agriculture, and aquaculture. Increased use of pesticides may result in increased human exposure to chemical contaminants in the food chain [High Confidence]”.</p> <p>There should be a separate finding of confidence for the potential use of increased pesticides and the potential to cause adverse health effects. This separate finding should discuss the low confidence in</p>	Ch 6: Food Safety		227	17	<p>Key Finding 2 has been revised to delineate confidence levels for different contaminants. Prescreening of pesticides is done under ambient environmental conditions. No prescreenings incorporate climate change. Therefore to assume that such prescreenings will, post facto, result in no additional exposure is in contrast to the existing literature which indicates that pesticide use may increase with climate change. Overall, this comment is inconsistent with the author team’s thorough assessment of the science regarding both toxins and pesticide exposure.</p>

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>the evidence base described by the authors, the regulatory mandated toxicity testing, and maximum use allowed for all pesticides (FIFRA) in the United States.</p> <p>Authors' description of the evidence base:</p> <p>“Consequently, there is low confidence regarding the specific impact that increases in pesticide exposure will have on human health. Given the evidence base and current uncertainties, there is medium confidence in the effects of climate change on increased exposure to chemical contaminants like mercury.”</p> <p>Recommendation</p> <p>A low confidence should be assigned to the potential to cause adverse human health outcomes. This is based on the fact that the toxicity prescreening of pesticides in the United States already confers a high degree of protection to citizens of the United States. Even if inspectors are placed under greater strain, the prescreening ensures upfront that consumers will not be exposed to potential hazardous concentrations of pesticides.</p>					
howard	feldman	<p>Key Finding 3 – Traceable Accounts</p> <p>“Rising atmospheric carbon dioxide will continue to lower the nutritional value of most food crops, including wheat and rice, and can also reduce the concentration of essential minerals in a number of crop species [Very Likely, High Confidence].”</p>	Ch 6: Food Safety		228	15	The Key Finding and traceable accounts have been revised. A decline in protein content would reduce the nutritional value.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		Recommend changing “lower the nutritional value” to “lower the protein content found in most...” This change would accurately reflect the data presented in the report. Nutrition is non-specific and can refer to many other conditions (as demonstrated by the authors’ specific use of “essential minerals” in the next sentence).					
howard	feldman	<p>Recommendation</p> <p>More specificity should be provided to the reader about the current trends in food safety and the portion that may be influenced by climate change. For example:</p> <p>Kovats 2004 – “These results suggest that temperature influences transmission of infection in about 35% of all cases of salmonellosis in England and Wales, Poland, The Netherlands, Czech Republic, Switzerland, and Spain...”</p> <p>Kovats 2004 – “Although the underlying trend in Salmonella infections is decreasing, due to active control measures, strategies are needed to combat the proportion of salmonellosis attributable to climate.”</p> <p>Reference</p> <p>Kovats, R. S., S. J. Edwards, S. Hajat, B. G. Armstrong, K. L. Ebi, and B. Menne, 2004: The effect of temperature on food poisoning:</p>	Ch 6: Food Safety		212	31	After consideration, we still feel the existing text is clear and accurate, and reflects the body of peer-reviewed literature available for impacts within the US. Though the citation provided is cited in this chapter, there is a lack of consensus in the literature in terms of percent causal attribution of illnesses to climate change in the United States.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		a time-series analysis of salmonellosis in ten European countries. <i>Epidemiology and Infection</i> , 132, 443-453.					
howard	feldman	<p>This section does not fully report the results of the literature and does not provide an accurate synthesis of the data.</p> <p>For example, Kim et. al 2014 (cited) reports E.coli is the most sensitive to increased temperature and humidity and speculates an increase in E.coli outbreaks will occur as a result of climate change. However, Kim et. al 2014 also reports norovirus outbreaks are highly correlated to colder and drier temperatures; climate change may lead to a decrease in norovirus cases. Since “human noroviruses are known to be the most common viral pathogen responsible for foodborne disease outbreaks...” even a small change in the transmission of this disease could lead to a reduction in overall food poisoning cases. This point is illustrated in Table 1 (“Climate change will not affect all foodborne pathogens equally...”); 71% of foodborne illnesses are caused by norovirus and a reduction in this incidence rate could lead to a dramatic reduction in overall foodborne illnesses.</p> <p>Recommendation</p> <p>Please rewrite this section to reflect the full range of results in the literature.</p> <p>Reference</p>	Ch 6: Food Safety		214	8	<p>Text has been revised to incorporate this perspective.</p> <p>We acknowledge in the text, in Table 1, and in Figure 3 that rising temperatures do not affect all pathogens equally; however, the statement that temperatures and weather extremes will intensify pathogen and toxin exposure is accurate. For example, norovirus outbreaks are also associated with precipitation extremes, even in warm regions like Australia. Text has been added to the pathogen section of this chapter to specifically describe climate impacts on norovirus and to explain that the impacts of climate change on norovirus is unclear due to both potential improvements in health outcomes (fewer cases in winter) and worsening health outcomes (elevated transmission during floods). This additional text has been added provide further detail on norovirus, improve clarity, and outline uncertainties regarding future climate projections on incidence.</p> <p>Overall, given the complexity of environmental forcings for norovirus epidemiology, there is insufficient evidence in the peer-reviewed literature to suggest that an increase in temperature per se will have any significant effect on its occurrence in the environment. These uncertainties have also been added to the Traceable Account section on Major Uncertainties for Key Finding 1.</p>

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		Kim, Y. S., K. H. Park, H. S. Chun, C. Choi, and G. J. Bahk, 2014: Correlations between climatic conditions and foodborne disease. Food Research International, doi:10.1016/j.foodres.2014.03.023					
howard	feldman	<p>“While there are potential food production benefits from such changes, warmer, longer seasons would also alter the length and occurrence of pathogen transmissions and chance of human exposure (Polley and Thompson 2009; Mills et al. 2010; Esteve-Gassent et al. 2014).”</p> <p>The references cited present hypothetical cases rather than actual cases. The potential for increased risk to human exposure is an important consideration, but the three references cited acknowledge there are large uncertainties present.</p> <p>Recommendation</p> <p>Please add a sentence recognizing and discussing the uncertainty present and that these references represent hypothetical cases and not actual cases supported by data.</p> <p>References</p> <p>Polley, L., and R. C. A. Thompson, 2009: Parasite zoonoses and climate change: molecular tools for tracking shifting boundaries. Trends in Parasitology, 25, 285-291, doi:10.1016/j.pt.2009.03.007</p>	Ch 6: Food Safety		215	5	Text has been revised to incorporate these suggestions and to recognize uncertainty in projections.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		Mills, J. N., K. L. Gage, and A. S. Khan, 2010: Potential influence of climate change on vectorborne and zoonotic diseases: A review and proposed research plan. Environmental Health Perspectives, 118, 1507-1514, doi:10.1289/ehp.0901389.					
howard	feldman	<p>The Okafo et al. 2003 reference discusses the use of untreated sewage in a developing country to irrigate crops and the potential outreach health professionals could conduct to reduce outbreak incidence.</p> <p>Recommendation</p> <p>Delete Okafo 2003 as it does not accurately reflect conditions present in the United States.</p> <p>Reference</p> <p>Okafo, C. N., V. J. Umoh, and M. Galadima, 2003: Occurrence of pathogens on vegetables harvested from soils irrigated with contaminated streams. Science of The Total Environment, 311, 49-56.</p>	Ch 6: Food Safety		215	27	Text and citations have been revised to incorporate this suggestion.
howard	feldman	“Mycotoxins are toxic chemicals produced by molds that grow on crops prior to harvest and during storage. Prior to harvest, increasing temperatures and drought can stress plants, making them more susceptible to mold growth (Cotty and Jaime-Garcia 2007). Warm and moist conditions favor mold growth directly and affect the biology of insect vectors that transmit molds to crops.”	Ch 6: Food Safety		215	32	The sentence does not suggest that climate change will always increase plant stress. Therefore, we feel that the existing text is clear and accurate.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>These sentences do not reflect the complexity described in the reference cited. Cotty and Jaime-Garcia 2007 states,</p> <p>“Analysis of this data revealed that cottonseed aflatoxin contamination has both temporal and spatial variation with contamination and rain positively correlated (Jaime-Garcia et al., 2003). This is in stark contrast to associations between increased contamination and drought in corn (Cole et al., 1982; Widstrom, 1996; Wilson and Payne, 1994) and peanuts (Cole et al., 1982, 1989; Wilson and Payne, 1994). In irrigated cotton contamination is associated with exposure of mature crops (open bolls) to increased humidity (Bock and Cotty, 1999; Cotty, 1991; Cotty, 2001).”</p> <p>In addition, Paterson and Lima 2010 states, “[o]btaining a clear picture of the influence of climate on overall crop contamination is complex and frequently intractable. Hence the effects of climate change will be difficult to ascertain.”</p> <p>Recommendation</p> <p>The section as written suggests climate change will always increase stress on plants. The section should be rewritten to reflect climate change may have differential effects depending on crop type and susceptibility.</p> <p>Reference</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>Cotty, P. J., and R. Jaime-Garcia, 2007: Influences of climate on aflatoxin producing fungi and aflatoxin contamination. International Journal of Food Microbiology, 119, 109-115.</p> <p>Paterson, R. R. M., and N. Lima, 2010: How will climate change affect mycotoxins in food? Food Research International, 43, 1902-1914, doi:10.1016/j.foodres.2009.07.010</p>					
howard	feldman	<p>Recommendation</p> <p>Suggest the text in the box on “Food Commodities Susceptible to Mycotoxin Infections” be revised by deleting lines 9 -14 (the sentence starting with: Aflatoxins (naturally occurring mycotoxins....)).</p> <p>As acknowledged in the text, aflatoxin is an important issue in the developing world where there are no regulatory limits on aflatoxins and there is a high HVC (hepatitis C) infection rate. However, mycotoxin is not as important in the United States and the language as written could raise unfounded concerns about the food supply. There are only 9-13 total yearly hepatocellular carcinomas attributable to aflatoxins in the United States as estimated by Liu and Wu 2010.</p> <p>In addition, the strength of association between children’s’ impaired development and immune suppression is not as certain as implied in the text (see Wild and Gong 2010).</p>	Ch 6: Food Safety		218	3	<p>The text has been reviewed and revised to be clear where we are talking about regulated versus unregulated food supplies, and to make this specific to the United States. Based on the expert opinion of the authors, while current levels are low, we find that climate change can increase the risk of mycotoxin infection, especially for corn. Regarding the text on aflatoxins, the wording has been revised to clarify potential impacts to unregulated food supplies.</p>

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>References</p> <p>Liu, Y., and F. Wu, 2010: Global Burden of Aflatoxin-Induced Hepatocellular Carcinoma: A Risk Assessment. Environmental Health Perspectives, 118, 818-824. doi:10.1289/ehp.0901388</p> <p>Wild, C. P., and Y. Y. Gong, 2009: Mycotoxins and human disease: a largely ignored global health issue. Carcinogenesis, 31, 71-82, doi:10.1093/carcin/bgp264</p>					
howard	feldman	<p>Potential environmental contamination following an extreme event is an import issue to discuss; the authors mention that contaminated crops will likely be destroyed following this type of event. There was considerable media hype around the “toxic soup” in New Orleans following Katrina, hype that was subsequently debunked.</p> <p>Manuel 2006 described the level of contamination in the floodwater following Hurricane Katrina as, “similar to normal storm water runoff, with somewhat elevated lead and VOC concentrations.” In addition, EPA sampled 54 Superfund sites and found none were compromised; other sediment testing found “volatile and semivolatile organic compounds, pesticides, and metals including aluminum . . . but at levels below what the ATSDR and CDC consider to be immediately hazardous to human health.” The elevated arsenic levels detected were also likely due to the natural high background level found across the region, not because of some specific storm related event.</p>	Ch 6: Food Safety		218	21	<p>The reference in question is a compilation of different agency and NGO assessments of contamination following Hurricane Katrina. The commenter’s appear to have emphasized only certain findings discussed in the paper. To avoid confusion or ambiguity, the reference has been replaced with a different reference that is more specific regarding Hurricane Katrina and contamination.</p>

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>Recommendation</p> <p>Consider revising this sentence/paragraph to reflect the relative small effect the flood had on chemical contaminants.</p> <p>Reference</p> <p>Manuel, J., 2006: In Katrina's Wake. Environ Health Perspectives, 114, A32-9.</p>					
howard	feldman	<p>Recommendation</p> <p>Suggest deleting the Pérez de León et al. 2012 reference. The paper discusses all of the ecological changes that may increase the risk of an outbreak bovine babesiosis via increased distribution of the tick vector. However, most of the risk factors discussed are related to land usage, common practices, and pesticide resistance, not climate change. The paper attributes the two tick outbreaks on record to the Atlantic Multidecadal Oscillation (increased humidity), not to anthropogenic climate change. Suggest using an alternate case study.</p> <p>Reference</p> <p>Pérez de León, A. A., P. D. Teel, A. N. Auclair, M. T. Messenger, F. D. Guerrero, G. Schuster, and R. J. Miller, 2012: Integrated</p>	Ch 6: Food Safety		219	18	Text has been revised to incorporate this suggestion.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		Strategy for Sustainable Cattle Fever Tick Eradication in USA is Required to Mitigate the Impact of Global Change. <i>Frontiers in Physiology</i> , 3, doi:10.3389/fphys.2012.00195.					
howard	feldman	<p>The statement, “for example, the faster growth of weeds relative to crops as CO2 levels rise” is inconsistent with the citation provided by the authors.</p> <p>The review article cited, Patterson et al. 1999, states the opposite finding. From page 712-713:</p> <p>“The different patterns of response of C3 and C4 plants to CO2 are of particular significance in weed/crop competition, because most of the world’s crops are C3 plants, while many major weeds are C4 plants (Patterson and Flint 1980)... CO2 enrichment stimulates the growth of C3 weeds and crops more than that of C4 species...”</p> <p>Table 1 on page 713 shows the response range for C3 and C4 weeds and crops. Since a majority of weeds are C4, CO2 fertilization would be expected to have more beneficial response for crops, not weeds. When comparing C3 crops (1.10 to 2.43 times) to C3 weed (0.95 to 2.72 times), the ranges presented are indistinguishable from one another and would require a more nuanced analysis to support the statement (e.g. specific crop / weed interaction; see Patterson et. al 1984).</p> <p>Recommendation</p>	Ch 6: Food Safety		219	22	Section has been rewritten for clarity. The reference in question has been replaced with a more appropriate reference.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>Please delete the following text: (for example, the faster growth of weeds relative to crops as CO2 levels rise.).</p> <p>Reference</p> <p>Patterson, D.T., Flint, E.P., Beyers, J.L. (1984) Effects of CO2 Enrichment on Competition Between a C4 Weed and a C3 Crop. Weed Science 32: pp. 101-105</p>					
howard	feldman	<p>This section on increased insects/pests only presents one case study to support the conclusion that pests (insects) will increase with climate change. There is a large trove of literature on the aphid, a common agricultural pest. The literature on the effect climate change will have on aphid numbers and distribution show a complicated picture and often depends on aphid species, presence of parasitoids, type of crop, and geographical location.</p> <p>For example:</p> <p>Newman et al. 2004 – “It is concluded that, when both factors [CO2 and temperature] are elevated, aphid population dynamics will be more similar to current ambient conditions than expected from the results of experiments studying either factor alone. This result has important implications for future experimentation.”</p> <p>McKenzie et al. 2013 – “Trends have become apparent in some aspects of insect herbivory in elevated CO2, for example, phloem feeders generally increase in abundance under elevated CO2,</p>	Ch 6: Food Safety		219	25	<p>Additional references and examples have been added to make it clear that numerous pests including insects are responding and will continue to respond to climate change. We have chosen not to include the references suggested by the commenter because they do not appear to reflect more recent published findings regarding aphids in a CO2/temperature context</p>

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>whereas leaf-miners generally decrease. Alternatively, further research may simply reveal a lack of general responses of above–belowground interactions to climate change. For instance, despite the large body of research on aphid–plant interactions under climate change, aphid responses to CO2 enrichment still appear to be highly species-specific.”</p> <p>Recommendation</p> <p>The references provided below should be incorporated into the report and the uncertainty represented in this research should be described to the reader; this research should be reflected in the confidence value presented in the Key Finding.</p> <p>References</p> <p>Hoover, J. K. and Newman, J. A. (2004), Tritrophic interactions in the context of climate change: a model of grasses, cereal Aphids and their parasitoids. <i>Global Change Biology</i>, 10: 1197–1208. doi: 10.1111/j.1529-8817.2003.00796.x</p> <p>McKenzie, S. W., Hentley, W. T., Hails, R. S., Jones, T. H., Vanbergen, A. J., & Johnson, S. N. 2013. Global climate change and above- belowground insect herbivore interactions. <i>Frontiers in Plant Science</i>, 4, 412. doi:10.3389/fpls.2013.00412</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>Newman JA, Gibson DJ, Parsons AJ et al. (2003) How predictable are aphid population responses to elevated CO2? Journal of Animal Ecology, 72, 556–566.</p> <p>Newman JA (2004) Climate change and cereal aphids: the relative effects of increasing CO2 and temperature on aphid population dynamics. Global Change Biology, 10, 5–15.</p>					
howard	feldman	<p>Suggest deleting the reference Portier, et. al. 2010 and replacing the reference with a case study of accidental over exposure to pesticides or a review detailing the same (see below). The aforementioned reference discusses potential effects that could result from anthropomorphic climate change and then outlines the research needed to address these questions. The document does not provide any references (aside from a review of inconsistent epidemiological data) that would inform a reader about the dose required to cause human health effects resulting from increased pesticide exposure.</p> <p>Recommendation</p> <p>Suggest using the following reference: Knaak J, Tan C, Dary CC. 2012. Pesticide regulations: exposure-dose modeling from FIFRA to FQPA. Prog Mol Biol Transl Sci. 112:117-62.</p> <p>References</p>	Ch 6: Food Safety		219	31	<p>After deliberation, the authors feel the current references are appropriate and adequate given the chapter's space limitations. The authors have deliberated and agreed that a case study of accidental over exposure to pesticides would be inappropriate here because it is not relevant to the section's focus on chronic effects. For more information on dose-response, akin to the reference suggested by the commenter, please see Appendix 1: Technical Support Document. The traceable accounts section for Key Finding #2 notes the varying levels of likelihood and confidence in the links between rising CO2/ climate change and altered pest incidence and distribution; between these changes in incidence/ distribution and an expected increase in chemical management; and between these increases in pesticide use and the specific consequences on human health in the Unites States. The text and the traceable accounts section documents the uncertainties that play a role in these findings.</p>

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>Knaak J, Tan C, Dary CC. 2012. Pesticide regulations: exposure-dose modeling from FIFRA to FQPA. Prog Mol Biol Transl Sci. 112:117-62.</p> <p>Portier, C. J., and Coauthors, 2010: A Human Health Perspective on Climate Change: A Report Outlining the Research Needs on the Human Health Effects of Climate Change, 80 pp., Environmental Health Perspectives and the National Institute of Environmental Health Services.</p>					
howard	feldman	<p>The first paragraph on pesticide residues would benefit from some revisions. There is no question that a changing environment will influence the life cycle, range, etc. of potential disease vectors. However, it does not follow that changes in the type or amount of pest controlling agents will enter the food chain as contaminants at levels that have the potential to cause adverse human health effects. The paragraph, as written, leads the reader to assume these events will happen and that this is a certain chain of events; the paragraph ignores the complex interaction between pest, host, and pesticide, and the safeguards already in place in the United States. The authors should also delineate between pesticides as used on crops and external parasites and antibiotics/chemicals used to treat infections presents in livestock.</p> <p>Recommendations</p> <p>Suggest deleting Guerrero et al. 2014.</p> <p>Guerrero et al. 2014 discusses the potential for tick resistance to various pesticides and does not discuss potential contamination to the food supply. While pesticide resistance is a very important</p>	Ch 6: Food Safety		220	1	<p>We appreciate the suggestion of the commenter; however, the comment is inconsistent with the author team's thorough assessment of the science. The paragraph as written reflects potential change and includes words like "may" and "could". There is no evidence based on our review of the peer-reviewed literature to support an assumption of complete certainty. References cited have been revised to provide more information.</p>

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>consideration in controlling disease vectors, a more relevant case study should be used for the Food Safety chapter.</p> <p>Suggest deleting Jaykus et al. 2008.</p> <p>Jaykus et al. 2008 is a brief summary of the literature and is by no means a thorough review. In regards to antibiotic residues in animals, Jaykus et al. 2008 is mostly speculative in nature and provides few references. Jaykus et al. 2008 briefly discusses the potential for increased use of herbicides/pesticides, but again the discussion is mostly speculation. Jaykus references only one study indicating increased temperature may degrade pesticides faster, but this is a retrospective study. A more recent study found no effect of temperature (+2oC) or increased CO2 concentrations on the degradation of a different pesticide (Mana 2012). This area of research is very sparse. Suggest this be discussed in the emerging issues section.</p> <p>Suggest replacing Jaykus et al. 2008 with reference:</p> <p>National Research Council (US) Committee on Drug Use in Food Animals. 1999. The Use of Drugs in Food Animals: Benefits and Risks. Washington (DC): National Academies Press (US). ISBN: 978-0-309-05434-8.</p> <p>This reference states (page 82):</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>“In the United States today, residues of carcinogenic chemicals or their genotoxic metabolites are rare in meat and meat products. FDA regulations have effectively prevented allergenic, toxic, and carcinogenic animal drug residues from entering the food supply. A review of the medical literature from 1966 to 1994 (National Library of Medicine 1994) yielded no evidence in short- or long term studies of human cancers traceable to carcinogenic animal drug residues in foods.”</p> <p>References</p> <p>Manna , Suman , Neera Singh , V. P. Singh. Effect of elevated CO2 on degradation of azoxystrobin and soil microbial activity in rice soil. Environ Monit Assess (2013) 185:2951–2960.</p> <p>National Research Council (US) Committee on Drug Use in Food Animals. 1999. The Use of Drugs in Food Animals: Benefits and Risks. Washington (DC): National Academies Press (US). ISBN: 978-0-309-05434-8.</p>					
howard	feldman	<p>Recommendation</p> <p>The introduction to nutrition is interesting and describes the potential effects from malnutrition, but it leaves the reader wondering what this section has to do with climate change. A transition sentence or paragraph could be added to lead the reader into the rest of the section.</p>	Ch 6: Food Safety		220	12	The first section providing background on nutrition necessary for understanding the following sections, which document and describe how CO2 affects nutrition. The author team has deliberated and agreed that the background and segue is appropriate.
howard	feldman	Section 6.4 Nutrition discusses the effects climate change has on food quality and how a potential reduction in micronutrients in crops may increase the susceptibility of malnutrition in people with	Ch 6: Food Safety		220	15	The sentence has been revised and the reference removed.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>adequate calorie intake, but whose diet is deficient in these micronutrients. The following sentence is misleading to readers:</p> <p>“Although it is difficult the economic cost of malnutrition associated with other diseases can be as high as \$157 billion per year in the United States (Snider et al. 2014)”</p> <p>Snider et al. 2014 refers to Disease Associated Malnutrition (‘DAM’). DAM arises as a side-effect of other diseases, including: the inability to ingest or absorb nutrients (inability to swallow, loss of appetite, etc.), increased energy needs of the disease, or restricted diet as a result of the treatment. DAM does not come from a reduction in the quality of micronutrients in crops and using this numerical figure at the end of the paragraph implies that it does.</p> <p>Recommendation</p> <p>Suggest deleting the sentence ... “Although it is difficult the economic cost of malnutrition associated with other diseases can be as high as \$157 billion per year in the United States (Snider et al. 2014)”</p> <p>Reference</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		Snider, J. T., M. T. Linthicum, Y. Wu, C. LaVallee, D. N. Lakdawalla, R. Hegazi, and L. Matarese, 2014: Economic Burden of Community-Based Disease-Associated Malnutrition in the United States. <i>Journal of Parenteral and Enteral Nutrition</i> , 38, 77S-85S, doi:10.1177/0148607114550000.					
howard	feldman	<p>The Report is intended to be focused only on health effects of the United States.</p> <p>Recommendation</p> <p>Suggest replacing the Schmidhuber and Tubiello 2007 with a more United States centered reference.</p> <p>Reference</p> <p>Schmidhuber, J., and F. N. Tubiello, 2007: Global food security under climate change. <i>Proceedings of the National Academy of Sciences</i>, 104, 19703-19708, doi:10.1073/pnas.0701976104.</p>	Ch 6: Food Safety		224	14	We appreciate the suggestion, but the reference is a discussion of global food security which implicitly includes the United States; consequently, we find it appropriate for the text.
howard	feldman	<p>Recommendation</p> <p>An introduction paragraph would be useful to readers before the emerging issues are discussed. Since some of these emerging issues are highly speculative due to the lack of data (e.g. climate and food allergies, arsenic, zoonosis, etc.), a brief introduction discussing what an emerging issue is and what data is lacking would be helpful to the reader.</p>	Ch 6: Food Safety		224	30	We have added a Front Matter section for the report as a whole where we clarify the approach to the “Emerging Issues” sections within each chapter.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
howard	feldman	<p>Suggest the section be renamed Climate and Food Allergies and the paragraph be reworked. The area of food allergens is a topic that is foremost in the minds of food scientists and food toxicologists. However, the Chapter’s authors provide no scientific evidence of the potential for CO2 increases to change the allergenicity of a food item; the two references cited address areoallergens. The paragraph as written, including the description for the “potential for life-threatening anaphylaxis” could potentially mislead readers into thinking climate change will increase the risk of these adverse health outcomes.</p> <p>Recommendation</p> <p>The paragraph should be written to reflect the lack of data in this area. Singer et al. 2005 found overall protein concentrations remained the same at elevated CO2 concentrations, but the composition changed. The protein concentration stability seems to be at odds with previously made statements that total protein concentrations will decrease as a result of increased carbohydrate synthesis.</p> <p>Reference</p> <p>Singer, B. D., L. H. Ziska, D. A. Frenz, D. E. Gebhard, and J. G. Straka, 2005: Research note: Increasing Amb a 1 content in common ragweed (<i>Ambrosia artemisiifolia</i>) pollen as a function of rising atmospheric CO2 concentration. <i>Functional Plant Biology</i>, 32, 667, doi:10.1071/fp05039.</p>	Ch 6: Food Safety		224	31	Section has been renamed; however, we explicitly state that CO2 can decrease protein, but can also change protein composition (as evidenced by the Singer reference). We also explicitly state that the role of CO2 in food allergies is uncertain and requires more research. As such, we feel the existing text is clear and accurate.
howard	feldman	There are studies that already report the ability of plants to accumulate heavy metals from the surrounding area. Welch et al. 2000 is a survey of current water concentrations across the United	Ch 6: Food Safety		225	1	We appreciate the suggestion and have revised the wording of the text to reflect the commenter’s concerns.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>States and does not discuss climate change. The paragraph as written implies that increases in water (not soil) heavy metal concentrations will lead to accumulation of these heavy metals that will result in adverse human effects; there is research available the authors can use to write a more accurate paragraph.</p> <p>Recommendation</p> <p>The paragraph should discuss the uncertainty around plant accumulation of heavy metals. The paragraph should discuss how any adverse human health outcome is partially determined by: how much heavy metal(s) is accumulated in plant tissues, the type of plant, the portion of the plant that is eaten, soil types, etc. In addition, it would be beneficial for the reader to understand that just because these elements are present; it doesn't mean that eating plants grown in the soil will result in adverse health outcomes. A suggested case study is:</p> <p>Dahal, B.M. et al. 2008. Arsenic contamination of soils and agricultural plants through irrigation water in Nepal. Environmental Pollution V. 155(1): 157-163.</p>					
howard	feldman	<p>Key Finding #2</p> <p>Here and elsewhere, the term “loss of essential infrastructure” might be replaced with “interruption of public services,” since the former could be interpreted to imply long-term physical damage, which does not seem to be the only meaning or even the dominant meaning, given the examples cited.</p>	Ch 7: Extreme Events		252		The text has been revised to incorporate this suggestion.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
howard	feldman	The projection regarding wildfires should be further qualified to account for likely regional differences. In addition, since there is currently insufficient evidence to link the occurrence of winter storms and severe thunderstorms to climate change, the value of the information provided in the table about these event types should be reconsidered. This comment also applies to Section 7.8, which covers the same event types.	Ch 7: Extreme Events	1	253		The text has been revised to incorporate this suggestion The uncertainty acknowledged in the chapter is with regard to future projections of winter storms and severe storms. With consideration of this uncertainty, the available literature on climate change impacts still identifies winter storms and severe storms as important potential sources of extreme events-related impacts within the US. Thus, the author team deliberated and agreed to include this as a short section in the chapter.
howard	feldman	The statement that “longer and more intense droughts... will contribute to supply disruptions...” should be further qualified. Just because there are disruptions to individual facilities does not mean that the system as a whole will be unable to supply electricity during an extreme event.	Ch 7: Extreme Events		256	27	The text has been revised to incorporate this suggestion.
howard	feldman	The term “catastrophic” should be defined here. Similarly, the term “epidemic-level” should be defined here, as its definition may not be apparent to all readers.	Ch 7: Extreme Events		257	38	The text has been revised to exclude mention of these terms.
howard	feldman	The sentence that begins “Because climate change is projected to alter the frequency or intensity of extreme precipitation events and hurricanes” should be more carefully worded, since some types of extreme events are projected to become more frequent while others are projected to be more intense. As written, those two meanings are conflated. The same problem occurs on p. 269, ll. 16-20. See also the assessment of confidence levels in the IPCC, Working Group I, Summary for Policymakers, which assigns low confidence to increases in hurricane intensity through the early 21st century.	Ch 7: Extreme Events		258	29	The text has been revised to incorporate this perspective.
howard	feldman	Section 7.9 This section does not appear to contain any new information, and it is not clear why these topics are the only ones identified as “emerging issues.”	Ch 7: Extreme Events		267		After consideration of this point, we still feel the existing text is clear and accurate. No change has been made to the text.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
howard	feldman	<p>Reference Consistency</p> <p>The Chapter on Mental Health inconsistently uses references to support statements made; some statements are made with one or no reference to support the statement, while other have eight or more. This inconsistency makes it very difficult for the reader to determine which part of the statement is conjecture and which reference is being used to support a particular point. For example:</p> <p>Page 299, Line 18-21 (eight references). “The interplay of mental health and extreme heat results in increased incidences of disease and death, aggressive behavior, violence, suicide, and psychiatric hospital admissions (Anderson 2011; Hansen et al. 2008; Martin-Latry et al. 2007; Hsiang et al. 2013; Page et al. 2012; Ranson 2014; Wang et al. 2014; Vida et al 2012).”</p> <p>Page 299, lines 7-14 (no references). “Nevertheless, there [is] steadily accumulating evidence documenting important associations between more gradual physical environmental impacts due to climate change and adverse mental health and well-being impacts. Consequential environmental changes such as sea level rise have the potential to affect mental health and well-being for coastal communities around the world, including some of the world’s largest population centers. Waterborne, vectorborne, and foodborne illnesses and asthma related to poor air quality and high temperatures all result in negative impacts on health, mental health and well-being for the family, work, school, and social life of those who become ill.”</p> <p>Recommendation</p>	Ch 8: Mental Health				<p>We thank you for the many suggestions and comments.</p> <p>A) References: The author team has made the appropriate revisions to ensure consistency in use of references to support statements.</p> <p>B) Key Findings, Confidence Assignment, and Description of Evidence Base: The authors have revised Key Finding 3 to incorporate this perspective.</p>

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>The chapter should be written in a consistent and concise manner. Each statement describing a possible adverse outcome should be supported by primary literature. Multiple references should be able to be ascribed to a particular health effect. Statements that cannot be supported with reliable and accurate references should be removed.</p> <p>Key Findings and Confidence Assignment</p> <p>The authors have high or very high confidence assigned to all of the Key Findings, yet the language used implies anything but certainty. When there are independent uncertainties in each event leading up to a potential adverse effect, the confidence that the final adverse event will occur should be low. Examples of uncertainty language used in the chapter include:</p> <p>Page 298, line 15: ...the number of individuals with severe stress and mental health reactions may be in the many thousands...</p> <p>Page 298, line 33: ... drought may be linked to increased incidence of suicide....</p> <p>Page 300, line 7: there is potential for a significant increase in human conflict. This includes heightened aggression, which may result in...</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>Page 303, line 12, 15, 17, and 19, respectively: The potential exists for an array of..... ; ...children may be at a higher risk than adults...; ...post-disaster, and, in general...; ...climate change may alter the biological stress...</p> <p>Recommendation</p> <p>The authors should discuss and/or quantify the uncertainty surrounding each of the Key Findings, including a discussion describing how the data is being extrapolated from one event (non-climate change) to a potential future, climate change related event. Because many of the Key Findings rely on this type of chained extrapolation, the Key Findings are written broadly to capture the full range of uncertainties present in a manner that diminishes accuracy. The Key Findings do not provide the reader with an accurate sense of how probable an outcome is, the magnitude of the potential effect, or what can be done to avoid the effect. Suggest reworking the Key Findings to be written more specifically, even if this reduces the confidence assignment.</p> <p>Key Findings and Description of Evidence Base.</p> <p>Recommend the authors provide a thorough description of the causal chain and assign a confidence rating to each. Recommend separate findings for climate changes to: 1) environmental change, 2) intermediary for potential human effect [environmental stressor], 3) potential for adverse human health outcome. In addition, the Description of Evidence Base might benefit from each</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		individual piece of evidence being assigned a confidence rating (See Chapter 6 as an example).					
howard	feldman	<p>Key Finding 3</p> <p>The finding that the perceived threat of climate change will cause adverse health effects to the public is poorly supported and overstated:</p> <p>“The threat of climate change, the perceived direct experience of climate change, and changes to one’s local environment can result in substantial adverse mental health outcomes and social impacts for the American public. Virtually all Americans are exposed to the threat of climate change and to events attributed to the impacts of climate change through frequent multi-media coverage. [High Confidence]” [emphasis added]</p> <p>First, polls show 25-40% Americans disagree human activity is driving global warming and those who think climate change is the result of human activity give it a low priority (33%) (Pew 2014; Scientific American 2015). Americans also believe climate change will not affect them personally (62%), even though they see potential effects for future generations (Slate 2015). The disbelief in climate change and the belief climate change will not negatively affect respondents personally make it very difficult to conclude these people will have adverse mental effects associated with media coverage; because they do not think climate change will affect them, they cannot manifest adverse mental health effects (adverse mental effects include: “preoccupation, general anxiety, pessimism, helplessness, eroded sense of self and collective control, stress, distress, sadness, loss, and guilt”).</p>	Ch 8: Mental Health		295	16	The key finding has been divided (first section High Confidence, second section Medium Confidence) to more accurately reflect science/confidence level. Several additional references have been added to support findings.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>Second, there is substantial research describing how different segments of the American populace will respond to news of climate change; the response is not universally associated with adverse mental health effects or similar emotional responses (Maibach et al. 2009). A review article in American Psychologist describes some of these divergent beliefs and responses (Doherty and Clayton 2011).</p> <p>Recommendation</p> <p>A detailed analysis should be conducted (on page 300-301); a thorough discussion on which segments of the population have an increased, decreased, or no change risk of mental health effects should be included. Generalized statements should be removed or clarified so the reader can interpret the analysis. Finally, the Key Finding should be written in more details and confidence intervals assigned to each step in the causation chain.</p> <p>References</p> <p>Doherty, T and Clayton, S. 2011. The Psychological Impacts of Global Climate Change. American Psychologist. Vol. 66, No. 4, 265–276. May–June 2011.</p> <p>Holthau, Eric. 2015. Poll: Americans Don't Think Climate Change Will Affect Them Personally. Slate. http://www.slate.com/blogs/the_slatest/2015/04/06/new_climate_c</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>hange_poll_shows_americans_believe_in_global_warming.html April 6, 2015.</p> <p>Maibach, E., Roser-Renouf, C., & Leiserowitz, A. 2009. Global warming's six Americas 2009: An audience segmentation analysis. New Haven, CT: Yale Project on Climate Change. Retrieved from http://environment.yale.edu/uploads/6Americas2009.pdf.</p> <p>Motel, Seth. 2014. Polls show most Americans believe in climate change, but give it low priority. http://www.pewresearch.org/fact-tank/2014/09/23/most-americans-believe-in-climate-change-but-give-it-low-priority/ . Pew Research. September 23, 2014.</p> <p>Vaidyanathan, Gayathri and ClimateWire. 2015. Big Gap between What Scientists Say and Americans Think about Climate Change. Scientific American. http://www.scientificamerican.com/article/big-gap-between-what-scientists-say-and-americans-think-about-climate-change/ . January 30, 2015.</p>					
howard	feldman	<p>The authors of this chapter have a penchant for using broad, non-specific statements without specific references to support the conclusion. For example:</p> <p>“Anything that affects human health and welfare has the potential to impact mental health and well-being. Therefore, the adverse mental health impacts of climate change are likely to be wide ranging, stressful, and cumulative.”</p>	Ch 8: Mental Health		296	6	Thank you for your comment. The sentences referenced have been adjusted to incorporate this perspective.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>Recommendation</p> <p>More deliberate and supported statements should be used and supported consistently throughout the chapter.</p>					
howard	feldman	<p>The authors state:</p> <p>“[t]he frequency of interpersonal violence and intergroup conflict rises as the climate moves toward warmer temperatures or more extreme rainfall.”</p> <p>This claim (or a point very similar) is made at multiple points throughout the chapter. However, the causal connection between increased temperature and increased violence is not as certain as the authors imply.</p> <p>The authors cite three references to support the claim increased temperature will lead to increased violence.</p> <p>The first paper, Anderson 2011, is primarily a review of his own published literature and does not provide critical analysis of alternative hypothesis.</p> <p>The second paper, Hsiang 2013, is a meta-analysis that used 60 published studies and 16 unpublished studies. Even ignoring the fact a significant portion of the data used for this analysis is</p>	Ch 8: Mental Health		300	1	<p>The authors appreciate the comments and have revised the text to incorporate this perspective. The text has also been revised to address the complexity of the topic. The suggested reference has been added:</p> <p>H. Buhaug, J. et al. 2014. One effect to rule them all? A comment on climate and conflict. Climatic Change. December 2014, Volume 127, Issue 3-4, pp 391-397.</p>

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>unpublished, Hsiang reanalyzed the 60 papers and developed his own conclusions; some of these conclusions were the opposite of the original authors. This seems to be a fatal flaw in the meta-analysis in and of itself. Another group of researchers critiqued Hsiang 2013 and found additional methodological errors in Hsiang 2013 (Buhaug 2014). These errors include: (i) cross-study independence, (ii) causal homogeneity, and (iii) sample representativeness. Buhaug 2014 used the same data available to Hsiang 2013 and after correcting for the identified methodological errors, found there was no association or causation between temperature and violence. The different conclusions reached by different researchers demonstrated this potential link is far from certain.</p> <p>The third paper, Ranson 2014, also claims to find an association between temperature and precipitation (together “climate”) and violent crime rates. Ranson 2014 assembles a database from monthly crime, temperature, and precipitation data for 2,972 U.S. counties over a 50-year period from 1960 to 2009. This data is aggregated into temperature bins (in 10oF tranches; sorted by the type of violent crime and then uses the SRES A1B climate change model assumptions (CO2 increases, population change, etc.) to estimate the total change to violent crimes in the United States in 2099. There are several issues with this analysis.</p> <p>Ranson 2014 uses climate zones as a surrogate for temperature increases with climate change and assumes all crimes committed in these climate zones are the same. By averaging the data this way, individual data and variation are completely ignored and the analysis becomes too generalized to make any specific predictions. Current and historical data demonstrate how inaccurate this type of averaging analysis can be.</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>1. Figure 1 shows the current temperature gradients across the United States; warmer areas do not necessarily have higher crime rates than their colder counterparts.</p> <p>2.</p> <p>3. The historical data presented in Figure 2 shows a declining trend for most violent crimes (simple assault has plateaued and rape is temperature insensitive). If temperature increases were associated with or causative of violent crimes, then the data should show a positive trend over the last 50 years correlating to the climate change that has already occurred; some researchers estimate the temperature has already warmed approx. 1.26 °F or 0.7 °C since 1979. This increase in temperature has not resulted in an increase in yearly violent crimes.</p> <p>4.</p> <p>5. Quantifying the “average” effect across these heterogeneous regions, weighting results by statistical precision but ignoring variations in substantive relevance and potential for generalization, makes little sense. The exercise is mathematically feasible but the outcome has no relevant meaning. This imprecision is then used in the prediction model; the prediction analysis ignores regional differences (e.g. economic, population shifts, police action changes, etc.) that will develop over the next century.</p> <p>6.</p> <p>Recommendation</p> <p>The authors should either change the language in the chapter to reflect this high degree of uncertainty in the published literature regarding the causal connection between temperature and violent crimes or delete these sections and references.</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		Reference H. Buhaug, J. et al. 2014. One effect to rule them all? A comment on climate and conflict. Climatic Change. December 2014, Volume 127, Issue 3-4, pp 391-397.					
howard	feldman	(Description of Evidence Base) This section repeats similar statements several times (e.g. “six case-control studies”) and is difficult to understand. Recommendation Delete the paragraph starting on Page 315, line 35 to Page 316, line 10; also delete Page 316, line 19-27 (the unique references can be added to the first paragraph). This information is either not supported with research and/or has already been stated in the first paragraph (Page 315, lines 12-30). Detailed comments and citations are provided in the appropriate chapter section.	Ch 8: Mental Health		315	35	This section has been reworked to remove redundancies, clarify citations, and describe in the order of the Key Finding.
howard	feldman	The Description of Evidence Base is intended to give the reader a research “trail” they can follow in order to form an opinion on the confidence findings of the authors. There are several statements made in the Evidence Base for Key Finding #4 that are not supported by research or are non-specific and reach overly broad conclusions; the authors do not provide a causal (or associative) trail in all instances. An example where no references are provided and where the statements are overly general is:	Ch 8: Mental Health		315	35	We appreciate the comment and we have removed the sentence.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>“Climate-related events and incidents have the potential to expose an estimated 200 million Americans to serious psychological distress. Most Americans live in cities, where individuals may be more exposed to heat waves. Individuals with prior mental illness are especially vulnerable to extreme heat or heat waves and there is a large body of research, which supports this finding with a high level of agreement.”</p> <p>Recommendation</p> <p>Delete this section or provide references supporting the numbers and the causal connection between each.</p>					
howard	feldman	<p>General Comments</p> <p>There are a number of instances throughout the chapter where studies and reports are inappropriately cited or not completely characterized to support statements. These are detailed in specific comments below. Additionally, many of the concepts and conclusions about vulnerability and populations of concern are rather broad with significant uncertainties, especially when factored into the rather complex causal chain being proposed regarding climate change impacts on health.</p> <p>Additional Chapter 9 References</p> <p>Agarwal, S., J. C. Driscoll, X. Gabaix, and D. Laibson, 2009: The Age of Reason: Financial Decisions over the Life Cycle and</p>	Ch 9: Populations of Concern				<p>Thank you for your suggested citations. Updates to text and references have been incorporated for each of these additions to Chapter 9 References. We agree that the causal chain relating climate change impacts to health is very complex.</p>

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>Implications for Regulation. Brookings Papers on Economic Activity, 2009, 51-117, doi:10.1353/eca.0.0067.</p> <p>Becker-Blease, K.A., Turner, H.A., Finkelhor, D. Disasters, victimization, and children's mental health. (2010) Child Development, 81 (4), pp. 1040-1052.</p> <p>Brault, M. W., 2012: Americans With Disabilities: 2010. Current Population Reports, U.S.Census Bureau,. [Available online at http://www.census.gov/prod/2012pubs/p70-131.pdf]</p> <p>CDC, 2013: Health Disparities and Inequalities Report--1 United States. MMWR. Morbidity and Mortality Weekly Report, November 22. [Available online at</p> <p>Cherry, K. E., S. Galea, L. J. Su, D. A. Welsh, S. M. Jazwinski, J. L. Silva, and M. J. Erwin, 2010: Cognitive and Psychosocial Consequences of Hurricanes Katrina and Rita Among Middle-Aged, Older, and Oldest-Old Adults in the Louisiana Healthy Aging Study (LHAS).</p> <p>Donner, W., and H. Rodriguez, 2008: Population Composition, Migration and Inequality: The Influence of Demographic Changes on Disaster Risk and Vulnerability. Social Forces, 87, 1089-1114, doi:10.1353/sof.0.0141.</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		Friel, S., M. Marmot, A. J. McMichael, T. Kjellstrom, and D. Vågerö, 2008: Global health equity and climate stabilisation: a common agenda. <i>The Lancet</i> , 372, 1677-1683.					
howard	feldman	<p>Key Finding #1</p> <p>Across the United States, people and communities differ in their exposures, their inherent sensitivity, and their adaptive capacity that enables them to respond to and cope with climate change related health threats. Vulnerability to climate change varies across time and geographic areas, across communities, and among individuals within communities [Very High Confidence].</p> <p>Figure 1 (page 385) defines “Vulnerability” as the interplay between health impacts and adaptive capacity. However, health impacts are characterized at the individual level (e.g. injury, mental health, illness, death), while adaptive capacity is defined on a community, institution or individual level. These concepts should both be on equal footing... i.e. defined as individual vulnerability or community vulnerability (or both), but not defined differently for different aspects of the overall model. If ‘adaptive capacity’ were defined on an individual-level, then consideration would go into factors such as age, genetics, pre-existing disease, etc.</p> <p>Additionally, the vulnerability model specifies that the interplay between “exposure” and “sensitivity” produces “health impacts”. In general, the vulnerability model proposed is too broad and encompassing. While it is true that individuals who are not exposed will not be vulnerable, this seems to be a different concept than true ‘heightened sensitivity’ to exposure (an arguably more typical way of defining vulnerability). Considering exposure could possibly lead to ‘double counting’ of exposure in accounting for health effects. While clearly exposure is needed for a health effect</p>	Ch 9: Populations of Concern		337	3	<p>Thank you for your comment. We have clarified the interrelationships between adaptive capacity at the individual and the community level. We have also modified Figure 1. This document defines increased vulnerability as having three components: increased exposure; increased sensitivity to that exposure; and reduced adaptive capacity. While other reports choose to separate exposure from the definition of vulnerability, the authors believe the clustering and interaction of factors that increase tendency to exposure and increased sensitivity to that exposure make it useful to combine them in the definition.</p> <p>In this chapter we define vulnerability as the interplay between sensitivity, adaptive capacity, and exposure, referring to the [Case Study: Mapping Heat Vulnerability in Georgia]. For many climate-related exposures (e.g. heat, pollen, etc.) the dose-response relationship is unknown, and a framework such as this provides a way to address vulnerability. Also, the term ‘adaptive capacity’ refers to the ability of a community to respond to a disaster (i.e. public health resilience); sensitivity refers to the social, environmental, medical factors that increase risk; exposure refers to the climate-related exposure (e.g. historic extreme heat days per county). These concepts are referred to in the Manangan et al. (2014) paper.</p>

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		to be manifest, exposure is more an aspect of dose-response than vulnerability.					
howard	feldman	<p>Key Finding #2</p> <p>Climate change related health risks interact with some of the same non-climate factors that increase the risk of poor health generally. Non-climate factors, such as those related to demographic changes, socioeconomic factors, and pre-existing or chronic illnesses, may amplify, moderate, or otherwise influence climate-related health effects, particularly when they occur simultaneously or close in time or space [High Confidence].</p> <p>The “key findings” throughout the chapter are often characterized in terms of “climate-related health effects”, rather than health effects of climate change. There is a background level of climate-related health effects that have nothing to do with the degree of climate change that is suggested to have occurred or that could occur in the future. All climate-related health effects (e.g., deaths from extreme weather events) cannot be ascribed to climate change, as these events occurred prior to the suggested change in climate.</p>	Ch 9: Populations of Concern		337	9	Thank you for this comment. While vulnerability to current and past climate variability will be closely related to vulnerability to climate change, the authors have sought to clarify and make consistent references to climate change vulnerability for the purposes of this assessment.
howard	feldman	<p>Key Finding 3</p> <p>People experience different vulnerabilities at different ages and life stages. For example, the very young and the very old are particularly sensitive to climate-related health impacts [High Confidence].</p> <p>The above statement hinges on the definition of “vulnerability”, which as discussed above has several limitations.</p>	Ch 9: Populations of Concern		337	16	Thank you for this comment. The authors have clarified the language of this key finding to focus on differences in inherent sensitivities. We have also changed the order of the Key Findings, so this is now Key Finding #2.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
howard	feldman	<p>The authors cite Donner and Rodriguez (2008) as support for their statement that some individuals choose to leave their homes due to increased frequency or severity of heat waves, extreme precipitation, drought, storms, or other weather extremes. However, the article cited provides little information about individuals choosing to leave their homes due to extreme weather events. Additionally, the USGPRC authors' statement implies a somewhat 'casual' decision by individuals to willingly abandon their homes because of these weather events. Donner and Rodriguez (2008) note that most oceanfront property owners must be forced off their property by these extreme weather events before they will leave. Moreover, Donner and Rodriguez (2008) note that many individuals simply cannot leave.</p> <p>Reference</p> <p>Donner, W., and H. Rodriguez, 2008: Population Composition, Migration and Inequality: The Influence of Demographic Changes on Disaster Risk and Vulnerability. <i>Social Forces</i>, 87, 1089-1114, doi:10.1353/sof.0.0141.</p>	Ch 9: Populations of Concern		340	1	We have incorporated a more appropriate citation to clarify this content. See Fothergill and Peek 2004.
howard	feldman	<p>Figures on the percentage of children expected to experience disaster during childhood are presented from a study by Becker-Blease et al. (2010). It is unclear why these figures are presented, as there is no indication whether the percentage is expected to increase or decrease over time.</p> <p>Reference</p> <p>Becker-Blease, K.A., Turner, H.A., Finkelhor, D. Disasters, victimization, and children's mental health. (2010) <i>Child Development</i>, 81 (4), pp. 1040-1052.</p>	Ch 9: Populations of Concern		346	6	This citation has been reviewed, and text in both the chapter and the Traceable Accounts has been revised for clarity and accuracy with regard to the findings of the cited study. The revised sentence reflects that the study presents survey results and does not make climate projections.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
howard	feldman	<p>A report from the Centers for Disease Control (CDC 2013) is cited inappropriately on two occasions to support the following statements: 1) “Compromised mobility, cognitive function, and other mental or behavioral factors: These factors can lead to increased exposure to climate-related health impacts if people are not aware of health threats or are unable to take actions to avoid, limit, or respond to risks (CDC 2013).”</p> <p>2) “People with disabilities experience disproportionately higher rates of social risk factors, such as poverty and lower educational attainment that contribute to poorer health outcomes during extreme weather or climate-related emergencies (CDC 2013)”. This CDC report discusses trends and factors related to social disparities in health, but no statements about climate change or impact of disparities during weather emergencies are made. An electronic search of this report indicated the words “climate” and “weather” were never used in the body of the text.</p> <p>Reference</p> <p>CDC, 2013: Health Disparities and Inequalities Report--1 United States. MMWR. Morbidity and Mortality Weekly Report, November 22.</p>	Ch 9: Populations of Concern		340	11	We thank the commenter for the helpful suggestion. This CDC report has been struck from the chapter. An appropriate citation has been identified and included in the text.
howard	feldman	<p>Studies by Brault (2010) and Agarwal et al. (2009) are cited several places in the text as support for the contention that cognitive deficits in the elderly may hinder effective and timely response to climate-related health risks and weather emergencies. Yet Agarwal et al. (2009) do not mention climate change or weather risks, nor provide data on how cognitively impaired elderly might or might not be able to respond to weather emergencies. Rather, Agarwal et al. (2009) is a study of the impact of cognitive deficits in the elderly on financial decision making. The paper by Brault (2010) describes a study of Americans with</p>	Ch 9: Populations of Concern		351	6	Updates have been made with respect to the use of these citations. The wording now more accurately conveys the content of these references.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>disabilities based on the U.S. Census, with no mention about response time for weather emergencies.</p> <p>References</p> <p>Agarwal, S., J. C. Driscoll, X. Gabaix, and D. Laibson, 2009: The Age of Reason: Financial Decisions over the Life Cycle and Implications for Regulation. Brookings Papers on Economic Activity, 2009, 51-117, doi:10.1353/eca.0.0067.</p> <p>Brault, M. W., 2012: Americans With Disabilities: 2010. Current Population Reports, U.S.Census Bureau, [Available online at http://www.census.gov/prod/2012pubs/p70-131.pdf]</p>					
howard	feldman	<p>The report makes the following general, sweeping and overly definitive statement about the psychological impact of extreme weather events: “Hurricanes and other severe weather events lead to mental or emotional trauma before, during, and after the event (Cherry et al. 2010).” A careful reading of the study by Cherry et al. 2010 shows that, while impacts on cognitive function, social engagement and storm-related disruption were observed in middle-aged and older adults, there was no such impact seen on individuals age 90 years and older – the age group that would presumably be the most susceptible. Moreover, Cherry et al. 2010 cite a number of studies that have found the elderly to be more resilient in natural disasters; this evidence is not cited by the USGCRP authors.</p> <p>Reference</p>	Ch 9: Populations of Concern		349	35	The chapter has been revised to include a more nuanced interpretation of the literature, especially with respect to the Cherry et al. 2010 paper and characterization of how older adults are more or less resilient to natural disasters.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		Cherry, K. E., S. Galea, L. J. Su, D. A. Welsh, S. M. Jazwinski, J. L. Silva, and M. J. Erwin, 2010: Cognitive and Psychosocial Consequences of Hurricanes Katrina and Rita Among Middle-Aged, Older, and Oldest-Old Adults in the Louisiana Healthy Aging Study (LHAS).					
howard	feldman	<p>The study by Friel et al. (2008) is incorrectly cited to support statements about Geographical Information Systems (GIS) and their role in linking data sources and identifying and positioning resources for at-risk populations. The Friel et al. (2008) paper does not mention the term GIS, but rather provide a conceptual overview of health inequality and climate change.</p> <p>Reference</p> <p>Friel, S., M. Marmot, A. J. McMichael, T. Kjellstrom, and D. Vågerö, 2008: Global health equity and climate stabilisation: a common agenda. <i>The Lancet</i>, 372, 1677-1683.</p>	Ch 9: Populations of Concern		356	18	We have revised the text to reflect this comment and provide more accurate use of the citation from Friel et al. 2008.
howard	feldman	<p>On April 7, 2015, the Environmental Protection Agency (“EPA”), on behalf of the United States Global Change Research Program (“USGCRP”), published a Notice of Availability of the Draft Impacts of Climate Change on Human Health in the United States: A Scientific Assessment (“Draft Health Assessment”). The American Petroleum Institute (“API”) and the Utility Air Regulatory Group (“UARG”) submit these joint comments on the entire Draft Health Assessment, and are also submitting comments in the chapter-by-chapter fashion required by the USGCRP Review and Comment System.</p> <p>API represents over 640 oil and natural gas companies, leaders of a technology-driven industry that supplies most of America’s energy, supports more than 9.8 million jobs and 8 percent of the U.S. economy, and, since 2000, has invested nearly \$2 trillion in</p>					This comment does not raise any questions or suggest any revisions.

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		U.S. capital projects to advance all forms of energy, including alternatives. UARG is a voluntary group of electric generating companies and national trade associations. The vast majority of electric energy in the United States is generated by individual members of UARG or by other members of UARG’s trade association members.					
howard	feldman	<p>Legal and Procedural Concerns</p> <p>In addition to the scientific and technical concerns documented in our chapter-specific comments, the Draft Health Assessment raises procedural and substantive legal concerns. First, the process adopted by the government for finalizing the report and seeking public comment has been unnecessarily constrained and will result in a less substantial final report. In the April 7, 2015 notice announcing the availability of the Draft Health Assessment, EPA, on behalf of the USGCRP, announced a 62-day comment period ending on June 8, 2015. On May 14 and 15, 2015, API and UARG submitted requests seeking an extension of the comment period, explaining that, given the complex technical nature of the information presented in the Draft Health Assessment, additional time was needed for the public to develop fully responsive comments on the draft. On May 21, 2015, the USGCRP denied those requests, stating that “[i]n our experience, a 60-day public comment [sic] has been an acceptable amount of time for groups to review similar scientific reports.” This rationale, which is not specific to the report at issue and which fails to recognize that there is no applicable deadline to the release of a final health assessment, is not an adequate basis for denying the public a reasonable amount of additional time to review and provide feedback on the Draft Health Assessment. By denying API and UARG’s reasonable extension requests, the USGCRP has arbitrarily minimized the role of the public in reviewing the Draft Health Assessment and contravened the overarching purpose of the Global Change Research Act (“GCRA”) to provide a complete, integrated analysis of climate change science.</p>					<p>This report was developed by USGCRP’s Interagency Group on Climate Change and Human Health as part of the sustained National Climate Assessment and as called for under the President’s Climate Action Plan. The National Climate Assessment has been mandated by Congress since 1990. The transparent process leading to this report is documented on our website and has included numerous avenues for the public to engage. As noted in the draft preface, regulatory and policy issues are beyond the defined scope of the Climate and Health Assessment, a scientific document that provides the basis for decision making, but does not address policy. The assessment does not include detailed discussions of climate mitigation, adaptation, or economic valuation. Consideration of greenhouse gas emissions pathways and human adaptive capacity (see Front Matter and Introduction Chapter) has been included as appropriate to assess projected climate impacts on human health. More information about the methods used in the quantitative modeling described throughout the report , including those highlighted, can be found in the underlying peer reviewed journals from which the results are reported. Uncertainties regarding timescales and geographic scales across multiple modeling approaches are described in the Technical Support Document (Appendix). A new figure also describes varying areas where uncertainty in projecting climate impacts on health outcomes occurs (see Introduction chapter and</p>

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		<p>In addition, the USGCRP Review and Comment System is cumbersome and discourages public participation. For example, the system requires registration and logs out the user after 15 minutes; it restricts comments to chapter-by-chapter entries with further subcategories; and it disallows the submission of a single document, which makes the 15 minute time-out even more restrictive. Furthermore, a commenter with restricted internet access, who is less computer savvy, or who has long and detailed comments may find the system sufficiently frustrating that the result is an abridgement of the comments or a decision to decline to comment altogether. And with no non-electronic option for submitting comments, this process sends the signal that only those with sufficient technological understanding and time are worth listening to. API and UARG recommend USGCRP revise its public comment process to simplify it and to improve access to all commenters. As noted below, the purpose of the Health Assessment is “assist the Nation and the world to understand” climate change-related health effects, 15 U.S.C. § 2936, not just those members of the public with ample technological access and skill.</p> <p>The Draft Health Assessment should also be revised to better express its intended purpose and its limitations. The notice accompanying the release of the Draft Health Assessment states that it “has been developed under the auspices of The Interagency Group on Climate Change and Human Health (CCHHG), a working group of the U.S. Global Change Research Program (USGCRP), as part of the ongoing efforts of USGCRP’s National Climate Assessment (NCA) and as called for under the President’s Climate Action Plan.” 80 Fed. Reg. at 18,619. The notice further explains that “[t]his draft USGCRP Climate and Health Assessment responds to the 1990 Congressional mandate to periodically produce National Climate Assessments and to assist the nation in understanding, assessing, predicting, and responding to human-induced and natural processes of global change.” Id; see also Draft Assessment at 23.</p>					<p>the Technical Support Document Appendix). The multiple factors involved in considering health impacts from climate change, including influences of non-climate factors and changes in a person’s or community’s vulnerability and adaptive capacity, are described in the Introduction chapter and the chapter on Populations of Concern. The assessment has been reviewed and revised to improve descriptions of adaptive capacity where appropriate and supported by the literature. The assessment does consider both benefits and harms to human health associated with climate change, as represented by the underlying literature supporting evidence of these impacts. This is noted in the Front Matter. Descriptions of the use of likelihood and confidence language are in the Front Matter, the introduction chapter, in detail in the Technical Support Document and Appendix on Likelihood and Confidence, and in every chapter’s Traceable Accounts. Front matter and an appendix also describes the process for drafting the report</p>

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		<p>The GCRA directs periodic preparation of a national climate assessment that does three things:</p> <p>(1) integrates, evaluates, and interprets the findings of the Program and discusses the scientific uncertainties associated with such findings;</p> <p>(2) analyzes the effects of global change on the natural environment, agriculture, energy production and use, land and water resources, transportation, human health and welfare, human social systems, and biological diversity; and</p> <p>(3) analyzes current trends in global change, both human-induced [sic] and natural, and projects major trends for the subsequent 25 to 100 years.</p> <p>15 U.S.C. § 2936. Accordingly, under the GCRA, a National Climate Assessment document, such as the Draft Health Assessment, is prepared for the specific—and limited—purpose of providing an integrated analysis of scientific information. Id. The purpose of that information, and of making it publicly available, is solely to “assist the Nation and the world to understand, assess, predict, and respond to human-induced and natural processes of global change,” id. § 2931(b), and to assist federal agencies “in the formulation of coordinated national policies for responding to human-induced and natural processes of global change pursuant to other statutory responsibilities and obligations,” id. § 2938(b)(2).</p>					

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		<p>Thus, the Draft Health Assessment is a purely informational document and as such cannot provide the basis for any regulatory action or serve as the scientific analysis or finding that may be required under any other statutory requirement. As described above, the GCRA defines the purpose of the Draft Health Assessment and provides the applicable legal standard for its preparation. Other federal laws, including those—like the Clean Air Act, the National Environmental Policy Act, and the Endangered Species Act—that federal agencies have previously invoked to address issues related to climate change, have different purposes and are governed by different legal standards. Accordingly, any assessment developed pursuant to the GCRA cannot supplant or substitute in any way for a scientific or policy assessment required under other federal law. The Draft Health Assessment should be revised to more clearly express this limitation.</p> <p>There draft report also contains considerable substantive shortcomings. At the broadest level, it fails to explore its own assumptions and their associated uncertainties. Frequently, for instance, it is unclear whether the report is assessing current effects, effects in 2050, or effects in 2100 or beyond. The timeframe of any purported effect is key to both the magnitude of the effect and the uncertainty associated with the effect, yet these issues are seldom addressed. Likewise, all of the findings made in the report depend on a series of assumptions happening without any other changes, such as adaptive responses or impacts of non-climate factors. The likelihood that all of these assumptions will occur is low but that is not explained. The report also appears to assume that all or nearly all climate change effects will be negative. A full examination of potential benefits must also be included. The only way to fully address these issues is by conducting an integrated uncertainty analysis. In the absence of such an analysis, the report’s findings are of limited value.</p>					

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		<p>Recommendation</p> <p>API and UARG recommend USGCRP reconsider its future position on comment deadline extensions, revise its public comment process to simplify it and improve access to all commenters, and revise the Draft Health Assessment to better express its intended purpose and the limitations on its use.</p>					
howard	feldman	<p>Informing Public Health Authorities</p> <p>In addition to these procedural and legal flaws, the content of this draft report is not consistent with what was described in the Final Prospectus for the Impacts of Climate Change on Human Health in the United States: A Scientific Assessment (“Final Prospectus”), which was published on 10/8/2014. This deviation from the Final Prospectus results in a report that is less scientific and informative to the intended audience. One stated goal of the report is to inform public health authorities and other public planning and resource management entities.</p> <p>“Such analyses will attempt to identify and bound impact uncertainties, as well as better define changes in attributable epidemiological risks, particularly for populations of concern, with the goal of informing public health authorities and other public planning and resource management entities.” - Page 1 of the Final Prospectus</p> <p>“The USGCRP Climate and Health Assessment will be designed to inform public health officials, urban planners, decision makers, and other stakeholders within and outside of government who are</p>					<p>As noted in the prospectus, the assessment does not include detailed discussions of climate mitigation, adaptation, or economic valuation. Consideration of greenhouse gas emissions pathways and human adaptive capacity (for instance, in changes to adaptive capacity for increased heat, or use of air conditioning -- see The chapter on Temperature-Related Illness and Death) has been included as appropriate to assess projected climate impacts on human health (see also the Introduction chapter and the Front Matter). The multiple factors involved in assessing health impacts from climate change, including influences of non-climate factors and changes in a person’s or community’s vulnerability and adaptive capacity, are described in The Introduction chapter and The chapter on Populations of Concern. The assessment has been reviewed and revised to improve descriptions of adaptive capacity where appropriate and supported by the literature. Policy issues, including building standards, are beyond the defined scope of the Climate and Health Assessment, a scientific document that provides the basis for decision-making, but does not address policy.</p>

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		<p>interested in better understanding the risks climate change presents to human health.” - Page 5 of the Final Prospectus</p> <p>The report, however, excludes appropriate consideration of adaptation or mitigation – factors that would be very informative and consistent with the responsibility of the authorities and experts for whom the report was prepared. The report also inconsistently discusses the capacity already present in society to absorb or mitigate potential adverse health effects. For example, Key Finding 1 for temperature-related deaths states:</p> <p>“Future climate warming could lead to thousands to tens of thousands of additional deaths each year ... calculated by extrapolating statistical relationships and without considering potential adaptive changes.”</p> <p>This statement ignores current trends in the state of the science on heat adaptation and mitigation and may overestimate potential deaths related to heat.</p> <p>Autonomous or planned adaptation in urban planning can dramatically reduce heat related mortality, even if that adaptation only reduces the temperature threshold by 1- 2 °C (Jenkins 2014). California has already incorporated adaptive measures into its building code as has New York City (Heat Adaptation Workgroup 2013; NYC 2015). California and other jurisdictions have compiled recommendations to help mitigate and adapt to increased temperatures; state and local governments, emergency response, and public health and health care professionals are urged to include heat projections into policies and projects to lessen the potential impacts of increased temperature (Gallucci 2013; Heat Adaptation</p>					

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		<p>Workgroup 2013). These recommendations include reflective roof tops, better placement of insulation, increased green spaces, and the use of more efficient air conditioners (AC).</p> <p>Air conditioning use in the United States has steadily increased over the past few decades and will continue to be a commonly used technology to mitigate the effects of temperature increase. The U.S. Energy Information Administration concluded in 2011 that:</p> <p>“Except in the temperate climate regions along the West coast, air conditioners are now standard equipment in most U.S. homes. As recently as 1993, only 68% of all occupied housing units had AC. The latest results from the 2009 Residential Energy Consumption Survey (RECS) show that 87 percent of U.S. households are now equipped with AC. This growth occurred among all housing types and in every Census region. Wider use has coincided with much improved energy efficiency standards for AC equipment, a population shift to hotter and more humid regions, and a housing boom during which average housing sizes increased.” (USEIA 2011)</p> <p>Several studies have documented the effect AC use has had on the reduction of heat related effects; air conditioning in St Louis and Kansas City reduced heat stroke by 400 percent (Davis et al 2003) and an estimated 21% of heat-related mortality during 1964-1988 may have been avoided if air conditioning had been used in New York City (Kalkstein 1993). The deployment of new and more efficient cooling systems is a continuing trend and will have a large impact on the estimates of heat related mortality in the United States.</p>					

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		<p>The ability to adapt physiologically to temperature changes has been widely documented. One study that examined migrant workers' adaptability to heat was Harrison 1998:</p> <p>“There is much evidence that adaptation to a major temperature change improves with length of exposure. Migrants from temperate conditions begin to be able to work at temperatures they initially found to be in tolerably high, and the likelihood of heat stroke progressively diminishes... These are the well-known phenomena of thermal acclimatization. Acclimatization may continue to improve over considerable time, but most people appear to achieve most of their improvement over a 14-21 day period, depending on various aspects of lifestyle.”</p> <p>A statistically derived temperature beyond which mortality rises significantly, or a “threshold temperature,” was a concept introduced in a study by Kalkstein and Davis (1989) and can vary by geographic region, socioeconomic differences, and physiological acclimatization. One case study demonstrated temperatures above 86°F (30°C) were associated with increased heat-related deaths in New York City, while there were minimal effects on mortality in Jacksonville, FL. Kalkstein and Smoyer (1993) later concluded acclimatized people in the southern US did not show heat-related increases in mortality and the most sensitive areas are those with intense but irregular heat waves. In a more recent study, Bobb et al (2014) demonstrated the US population has become more resilient to heat over time. Deaths attributed to heat have fallen to 19 deaths per each 10 degrees Fahrenheit increase in 2005 versus 51 heat-attributable deaths per each 10 degrees Fahrenheit increase in temperature in 1987. The authors concluded this decrease could not be solely attributed to increased prevalence of air conditioning. These studies demonstrate the</p>					

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		<p>ability of the population to physiologically adapt to temperature changes.</p> <p>Recommendation</p> <p>The authors should consider a section in each chapter discussing the key risk(s); current and projected trends, adaptations, and capacities; climatic drivers (e.g. temperature, weather, etc.); and the timeframe these effects are predicted to occur. A useful graphic summarizing this information is used in the 5th IPCC Report on Climate Change on pages 21-25. This type of information and graphical representation will help policymakers understand the key risks and potential options available to mitigate potential adverse health outcomes. This method also avoids advocating specific policy choices, which is one of the stated goals of this report.</p> <p>References</p> <p>Bobb, J. F., R. D. Peng, M. L. Bell, and F. Dominici, 2014: Heat-Related Mortality and Adaptation to Heat in the United States. <i>Environmental Health Perspectives</i>, 122, 811-816, 40</p> <p>Davis, R.E., P.C. Knappenbergre, P.J. Michaels, and W.M. Novicoff. "Changing Heat-Related Mortality in the United States." <i>Environmental Health Perspectives</i> 111: 1712–18 (2003).</p>					

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		<p>Harrison G (1998). Physiological Adaptation. In: Human Adaptation, pp 56-57. [Harrison A and Morphy H, eds.] Oxford University Press; Oxford, UK, 1998.</p> <p>IPCC, 2014: Summary for policymakers. In: Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 1-32.</p> <p>Gallucci, Maria. 6 of the World's Most Extensive Climate Adaptation Plans. InsideClimate News. June 20, 2013. Available at: http://insideclimatenews.org/news/20130620/6-worlds-most-extensive-climate-adaptation-plans.</p> <p>Heat Adaptation Workgroup, a subcommittee of the Public Health Workgroup, California Climate Action Team (CAT). Preparing California for Extreme Heat Guidance and Recommendations. October 2013. Available at: http://www.climatechange.ca.gov/climate_action_team/reports/Preparing_California_for_Extreme_Heat.pdf.</p> <p>Jenkins, Katie, Jim Hall, Vassilis Glenis, Chris Kilsby, Mark McCarthy, Clare Goodess, Duncan Smith, Nick Malleson, Mark</p>					

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		<p>Birkin. 2014. Probabilistic spatial risk assessment of heat impacts and adaptations for London. Climatic Change. 124:105–117.</p> <p>Kalkstein LS and Davis RE. Weather and human mortality: an evaluation of demographic and interregional responses in the United States. Annals Assoc Amer Geog. 79(1), 1989, pp. 44-64.</p> <p>Kalkstein LS. Health and climate change. Direct impacts in cities. Lancet. 1993 Dec 4;342(8884):1397-9</p> <p>Kilbourne EM, Choi K, Jones TS, Thacker SB. Risk factors for heatstroke. A case-control study. JAMA. 1982 Jun 25;247(24):3332-6.</p> <p>Longstreth J (1991). Anticipated public health consequences of global climate change. Environ Health Perspect. Dec;96: 139-44.</p> <p>NYC 2015. NYC Cool Roof Program. 2015. Available at: http://www.nyc.gov/html/coolroofs/html/home/home.shtml</p> <p>USEIA. US Energy Information Agency. Air conditioning in nearly 100 million U.S. homes. August 19, 2011. http://www.eia.gov/consumption/residential/reports/2009/air-conditioning.cfm</p>					
howard	feldman	Systematic Review of the Current Scientific Literature					The Climate and Health Assessment is based upon a variety of sources. All sources were assessed to meet the guidance to authors on Information Quality. This guidance assures that

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		<p>The Final Prospectus strongly implied a thorough, systematic review of the existing literature would be conducted to “aggregate and assess current quantitative research on human health impacts of climate change, and summarize the current state of the science.” For example:</p> <p>“The USGCRP Climate and Health Assessment will be an evidence-based, quantitative assessment of observed and projected climate change impacts on human health in the United States.” - Page 1 of the Final Prospectus</p> <p>“The authors will review and assess the peer-reviewed literature in each focus area in order to summarize the state of the science regarding observed and projected health-related climate change impacts...” - Page 2 of the Final Prospectus</p> <p>Despite these statements, the USGCRP has provided no details as to how the studies were selected (e.g., sources reviewed, terms used for searching, inclusion/exclusion criteria, etc.). Although we stressed the need for systematic review during the initial public comment period for the report’s scoping and planning, this recommendation appears to have been disregarded.</p> <p>Recommendation</p> <p>The authors for each chapter should provide the details of the literature search conducted, including the search terms, databases,</p>					<p>sources comply with Information Quality Act requirements for (1) utility, (2) transparency and traceability, (3) objectivity, and (4) integrity and security. Literature review guidance and weight of evidence guidelines were used in the development of this assessment and have been documented in a new appendix describing the Literature Review Process.</p>

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		and criteria for inclusion/exclusion used. This information could be included in the Appendix.					
howard	feldman	<p>Uncertainty Analysis</p> <p>The Final Prospectus states that uncertainty will be characterized and discussed.</p> <p>“Uncertainty will be characterized as qualitative confidence levels and, where possible, quantitative probabilistic likelihoods of specific impacts across a range of scenarios and possible outcomes. Measures of uncertainty will be based on scientific evidence, statistical analysis of observations or model results, and expert judgment.” - Page 5</p> <p>The Traceable Account at the end of each chapter is intended to inform the reader about the strength and weakness of the supporting data for each Key Finding. The Appendix in this report states:</p> <p>“This is further complicated by a number of additional limitations, including the fact that data are often incomplete, may not include a representative sample of all members of society, and rely on self-reporting of disease status.” (Page 397, line 7)</p> <p>However, the Key Findings themselves rarely discuss these issues, and the data used to support some of the Key Findings are presented as more robust than they actually are (e.g. there is only one study available on a topic or there are unreported conflicting</p>					<p>The Introduction chapter and the Technical Support Document (Appendix) provides information on modeling approaches used in the report and on uncertainty. A new figure also describes varying areas where uncertainty in projecting climate impacts on health outcomes occurs (see Introduction chapter and the Technical Support Document Appendix). More information on the methods used in the quantitative modeling described throughout the report, can be found in the underlying peer reviewed journals from which the results are reported. Uncertainties regarding timescales and geographic scales broadly across multiple modeling approaches are described in the Technical Support Document (Appendix). Descriptions of the use of likelihood and confidence language are in the Front Matter, the introduction chapter, in detail in the Technical Support Document and Appendix on Likelihood and Confidence, and in every chapter’s Traceable Accounts. Front matter and an appendix also describes the process for drafting the report. All Key Findings and Traceable Accounts have been reviewed and revised for consistency in use of likelihood and confidence languages outlined in the Introduction chapter, the Front Matter, and the appendix on likelihood and confidence.</p>

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		<p>study results). These are additional sources of uncertainty that are not discussed in most of the Key Findings. The lack of discussion about uncertainty in the analysis limits the ability of readers to determine the magnitude and direction of potential impacts on human health due to climate change.</p> <p>Recommendation</p> <p>All uncertainties and data limitations should be quantified to the extent possible and clearly conveyed to the reader. The USGCRP should conduct an Integrated Uncertainty Analysis. Such an analysis would almost certainly show that lower confidence in the magnitude and timing of the various effects under review is warranted. This approach would be far superior to the consideration of each endpoint individually, as the report does, which has the effect of exaggerating the possible effects.</p>					
howard	feldman	<p>Key Findings and Causal Chain</p> <p>Many of the Key Findings are written in a way that does not accurately reflect all the causal findings in the Traceable Accounts; some findings that have different confidence levels are grouped together in the Key Finding, resulting in an “averaged” confidence finding. In some cases, confidence levels are assigned to different pieces in the causal chain, but only the final determination is represented in the Key Finding.</p> <p>The Final Prospectus describes what a Key Finding should entail:</p>					<p>Descriptions of the use of likelihood and confidence language are in the Front Matter, the introduction chapter, in detail in the Technical Support Document and Appendix on Likelihood and Confidence, and in every chapter’s Traceable Accounts. Front matter and an appendix also describes the process for drafting the report. All Key Findings and Traceable Accounts have been reviewed for consistency in use of likelihood and confidence language, as outlined in the Introduction chapter, the Front Matter, and the appendix on likelihood and confidence.</p>

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		<p>“To the extent a detailed breakdown of evidence is supported by the scientific literature, the authors will attempt to distinguish between changes in risk, changes in exposure, and changes in outcomes, and characterize the strength of evidence for each ‘link’ in the causal pathway.” – Page 1 of the Final Prospectus</p> <p>The Key Findings should assign a confidence level to each piece of the causal chain so a reader can follow the authors’ logic.</p> <p>Recommendations</p> <p>A section or text box at the beginning of each chapter describing what each likelihood and confidence level means might assist the reader in interpreting the Key Findings.</p> <p>The Key Findings should be expanded to include confidence levels for each piece of the causal chain. Each potential adverse human health outcome should be described with:</p> <ol style="list-style-type: none"> 1) Confidence a change in the environment will occur; 2) 3) Confidence the environmental change will result in a change to the environmental stressor that interacts with humans to cause an adverse effect; 4) 					

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		5) Confidence an adverse (or beneficial) human health outcome will occur.					
howard	feldman	<p>Effects Already Attributed to “Climate Change”</p> <p>Many of the chapter authors state that “climate change is already causing...a range of health impacts” (e.g., Page 338, Line 2) or use some similar phrase . There are, however, substantive inconsistencies in how the chapter authors address this issue. The authors, for instance, discuss the data supporting these types of statements to varying degrees and typically do not attempt to disaggregate current effects from potential future effects.</p> <p>Recommendation</p> <p>Authors should define what specifically they mean by “climate change” and clearly describe which health effects result from current climate change and which health effects may occur due to future change. This will ensure consistency throughout this report.</p>					The entire report has been reviewed with this consideration to provide additional clarity when describing observed versus projected impacts.
howard	feldman	<p>Definition of “Climate Change”</p> <p>To key stakeholders reading this assessment who are not scientists, the term “climate change” is synonymous with anthropogenic climate change. However, there is no clear definition of what type of climate change (natural, anthropogenic, or both) is being considered in this report. The authors of the various chapters seem to use the term interchangeably. For example, Chapter 8 conflates seasonal temperature change with predicted temperature changes attributed to anthropogenic climate change. The lack of a definition prevents the reader from effectively interpreting what effects are</p>					A definition of climate change is provided in the final report glossary. The entire report has been reviewed with this consideration to provide additional clarity in terminology.

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		<p>attributable to anthropogenic climate change. This distinction is important to understand what effects can reasonably be mitigated.</p> <p>Recommendation</p> <p>Clearly define what is meant by the term “climate change” in the Executive Summary and at the start of each chapter. The reference to the 3rd National Climate Assessment may not sufficiently inform the reader. Ensure the chapter authors are using the term consistently and where possible, attribute effects to cyclical (seasonal), natural, and anthropogenic climate change.</p>					
howard	feldman	<p>The Executive Summary is fairly long and should be shortened to present only the highlights of the report’s findings. The Executive Summary should be updated to reflect the comments and suggestions submitted through this public comment period.</p> <p>Recommendation</p> <p>Create a shortened executive summary or “tear sheet” (1- 3 pages) that succinctly summarizes the findings of the report. The current Executive Summary could be retained and renamed.</p>	Executive Summary				Thank you for this suggestion. Further communication products will be available upon the release of the final report.
howard	feldman	<p>The Executive Summary begins with statements that do not reflect the report’s full conclusions:</p> <p>“Climate change is a significant threat to the health of the American people...” - Page 2, Line 2).</p>	Executive Summary		2	2	After consideration of this point, we still feel the existing text is clear and accurate, and based on the expert assessment of peer reviewed literature.

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		<p>“Almost all of these threats are expected to worsen with continued climate change.” [Emphasis added, implies a higher degree of certainty and confidence than reported]. – Page 2, Lines 14-15.</p> <p>“While all Americans are at risk, some populations of concern are disproportionately vulnerable, including those with low income; some communities of color; those with limited English proficiency; immigrant groups; Indigenous peoples; children and pregnant women; older adults; certain occupational groups; persons with functional disabilities; and persons with preexisting or chronic medical conditions.” - Page 2, Lines 24-28. [Implying that all members of these communities will be more affected].</p> <p>These general statements are not necessarily supported by the subsequent analysis and run counter to this report’s intended scientific and informational purpose. The USGCRP Climate and Health Assessment will be:</p> <p>“... an evidence-based, quantitative assessment of observed and projected climate change impacts on human health in the United States.” - Page 1 of the Final Prospectus</p> <p>“The USGCRP Climate and Health Assessment will be designed to inform public health officials, urban planners, decision makers, and other stakeholders within and outside of government who are interested in better understanding the risks climate change presents to human health.” - Page 5 of the Final Prospectus.</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>Recommendation</p> <p>Consider rewriting the first few paragraphs summarizing the results of the 3rd National Climate Assessment, detailing what information we already know and provide a transition from the 3rd NCA to the current report. This would provide a reader with the necessary context to judge the subsequent analysis.</p>					
Jason	West	<p>First, I find the title "Traceable Account" to be not very clear or helpful. Perhaps "Justification for Key Finding".</p> <p>Second, the wording of "Key Finding 1" is a little convoluted. I think you want to make 3 points - 1) Climate change will tend to increase ozone, 2) increased ozone is bad for health, and 3) such changes will make it harder to meet future ozone standards. The statement leaves #1 implied without actually saying it. I think it would be more clear to write the key finding with 3 sentences that relate to the 3 points I've made above. I'd suggest it's title be "Exacerbated Ozone Health Impacts Due to Climate Change" as it is not clear that ozone health impacts in general will increase.</p> <p>Third, I think that the authors express confidence in the "Key Finding 1" that is beyond what is justified. Yes several modeling studies have largely shown increases in ozone over the US, and yes ozone is expected to be associated with health effects. But those studies also show complex patterns of increases and decreases, and those patterns differ strongly among studies. The models also do not include all relevant processes by which climate change can affect ozone. Among these are fires and land use, which are highlighted as uncertainties for PM2.5, but are also important for ozone.</p>	Ch 3: Air Quality		102	1	<p>Regarding comment 1: Thank you for your suggested change in nomenclature. The term "Traceable Account" is applied throughout the report and is defined elsewhere in the report.</p> <p>Regarding comment 2: In Key Finding 1 we indicate that "future as meteorological conditions become increasingly conducive to forming ozone (O3) over most of the United States". We believe also that the existing language is both clear and accurate.</p> <p>Regarding comment 3: We believe that the existing text is well supported by the empirical evidence.</p>

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
Jason	West	I don't think that "feedbacks" is the right word. Rather "Although certain pollutants ... cause changes in climate" or "...force the climate system".	Ch 3: Air Quality		88	32	The text has been revised to incorporate this suggestion.
Jason	West	I'm surprised that you don't reference the very good review article by C. Weaver et al. (Bull Am Met Soc 2009), here and elsewhere in the chapter).	Ch 3: Air Quality		89	22	We have added the suggested citation in our chapter assessment.
Jason	West	I don't think it's true that Bloomer et al. show that climate change has already increased ozone. They find a statistical relationship between weather variables and ozone.	Ch 3: Air Quality		89	25	The text has been revised to incorporate this accurate comment.
Jason	West	"are expected to change in the future". This is true, but the point here should be that they are expected to change because of climate change.	Ch 3: Air Quality		89	35	Because there can also be changes in ozone precursor emissions unrelated to climate change, we believe the existing text is accurate.
Jason	West	This is good discussion, but it is not made clear what effect climate change might have.	Ch 3: Air Quality		90	18	After consideration of this point, we still feel the existing text is clear and accurate. The climate effects are discussed in subsequent sections.
Andrew	Young	This chapter has provided me with a ton of information about the quality, quantities, and safety concerning the food we put into our bodies. The most interesting part that stood out to me was how co2 and nitrogen exposure levels directly affect the amount of protein and carbohydrates in starch vegetables like rice, wheat and potatoes. The link to chemical contaminants in our food is also very clearly presented, as climate increases the distribution of pests, parasites and microbes, the need to use pesticides and other chemical to eliminate their threat will pose a threat to us as well. It may eliminate the pests on our food but it will increase our exposure to dangerous chemicals. This brings me to think of better remedies to this problem. Specifically I think alternative methods of farming could be utilized to a much greater and widespread extent that could help protect our food supply from both pests and pesticides. Indoor, underground, and vertical farming could be put to great use here. Imagine a 100 floor skyscraper that was simply a vertically organized indoor greenhouse farm for vegetables. It could be pest free, because in would be indoors, and therefore chemical free since there wouldn't be any pests to eliminate. This would be an epic solution to the problem of pests and pesticides. It would take a decent amount of monetary investment to become a flawless system for producing safe, organic produce, however the benefits would greatly outweigh the cost in our ever changing	Ch 6: Food Safety				We appreciate your positive comments and hope that you find the content useful. The comments and suggestions of the commenter in regards to adaptive responses are also appreciated but beyond the scope of the chapter.

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		environment. If developed to the greatest extent of our knowledge and technological capabilities it could be the savior and preservation of the human species in the long run. What I mean by this is that eventually people will need to leave this planet and we'll need a safe source of consumable plants. If indoor farming could be mastered and implemented on a massive scale it could provide humankind with a safe food source wherever we go. If at some point we have space colonies or large space stations they will need to have mastered indoor, compact farming that could be done in or attached to our space vessels. With an ever changing climate and many claiming that longstanding damage has already been done we need to be able to eliminate all the variables and instances in this chapter that cause our food to be unsafe and take full control over the production of food, so that humankind will be able to survive in the long run.					
Jason	West	These few sentences are unclear. Transported ozone can be important, but what is the climate influence? Water vapor may destroy ozone - I think this means to say HOx radicals derived from water vapor, and that happens in both upstream rural areas and polluted areas. But what is the climate influence?	Ch 3: Air Quality		91	7	The text has been revised to incorporate this comment.
Jason	West	"coupled" is not explained. And I think that many studies use models that are not coupled in very meaningful ways.	Ch 3: Air Quality		91	19	The text was not changed.
Jason	West	This section is a little confusing. It references a "consensus" of increases in ozone. I think it means to focus on changes in ozone over the US because ozone may decrease elsewhere, and that should be explicit. But then it mentions several studies in which ozone is projected to decrease, without giving citations. I think the modeling literature shows a tendency for ozone to increase over the US, but with localized decreases in a majority of studies, and that the magnitude and pattern of changes differs among models. I don't think it's the case that some studies show uniform increases over the US, while other show decreases. Rather, all studies show a mixture of increases and decreases, with predominant increases. That picture of the literature should be more clear.	Ch 3: Air Quality		91	20	The text has been revised to incorporate this suggestion.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
Vijay	Limaye	Brief reference to what causes water-related illness, e.g. drought and extreme precipitation disrupting water systems and sources. Existing text focuses on water contaminants without acknowledgement of drought-related issues.	Executive Summary		11	1	Please see the chapter on water related illness and the chapter on Extreme Events for more information on this topic.
Vijay	Limaye	Food security also is related to suitability of regions to grow crops or harvest food (e.g. aquatic food) in specific climates, which may be disrupted due to drought or other changing climate (not just due to increasing pathogen exposures or chemical contaminants, distribution disruptions).	Executive Summary		13	1	As noted in the chapter on Food Safety, food production is beyond the scope of the chapter, as these topics are covered in separate assessments. This chapter focuses on food safety, nutrition, and distribution.
Jason	West	"hundreds to thousands" should clarify that this is "per year" and should clarify that this is "in the US" (if indeed that's the case).	Ch 3: Air Quality		92	4	We revised the text for clarity
Vijay	Limaye	Specifically mention hurricanes, wildfires, flooding and drought	Executive Summary		15	1	The text has been changed in the executive summary to match the findings of the underlying chapter. Please see the chapter on Extreme Events for more information on these topics.
Vijay	Limaye	Include persons with disabilities and pre-existing health conditions	Executive Summary		15	1	The text has been changed in the executive summary to match the findings of the underlying chapter. Please see the chapter on Extreme Events and the chapter on Populations of Concern for more information on these topics.
Vijay	Limaye	Include persons with disabilities	Executive Summary		17	1	The text has been changed in the executive summary to match the findings of the underlying chapter. Please see the chapter on Mental Health and the chapter on Populations of Concern for more information on these topics.
Vijay	Limaye	Include persons with disabilities	Executive Summary		19	13	The text has been changed in the executive summary to match the findings of the underlying chapter. Please see the chapter on Mental Health and the chapter on Populations of Concern for more information on these topics.
Vijay	Limaye	Is there firm evidence of wildfire linked to newly diagnosed respiratory problems? I don't think the cited examples show that, as they use either data from emergency department visits, hospitalizations and physician visits, but it's not specified that the	Ch 7: Extreme Events		264	24	The text has been revised to incorporate this suggestion.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		events have been verified as incident cases. Could say instead, "...smoke from wildfires has been linked to patients seeking care for respiratory problems..."					
Vijay	Limaye	Include information that cardiovascular impacts have been seen in some studies and populations, and cardiac arrests have been seen increased (Dennekamp 2015).	Ch 7: Extreme Events		264	24	The literature has consistently shown null results for associations between forest fire smoke exposure and cardiovascular outcomes (refer to included reference Henderson et al. 2011). Therefore, the authors feel the existing text is clear and accurate.
Vijay	Limaye	Thelen's analysis was based on a composite variable, rather than individually assessing increases in each of those conditions. Could simply say instead, "...excess emergency room visits for a composite of respiratory health conditions, including..."	Ch 7: Extreme Events		264	34	The authors feel the existing text is clear and accurate.
Vijay	Limaye	Could consider including reference to evacuations and health impacts of such here.	Ch 7: Extreme Events		264	1	Various sections of the chapter provide discussion of health impacts associated with evacuations. Due to the size of the topic, and the page limit for the chapter, we focused on broad trends rather than delving too deeply. No change has been made to the text.
Vijay	Limaye	Include reference to mental health effects of wildfires. (e.g. Caamano-Isorna 2011)	Ch 7: Extreme Events		265	1	The text has been revised to incorporate this suggestion.
Jason	West	These last two paragraphs introduce some uncertainties, but I think they can be more complete. In particular, there are missing processes of climate effects on fires and ecosystems that are discussed for PM later, but are also relevant for ozone. I think this is an important limitation. The last part on climate-related stressors is good, but ends without a conclusion.	Ch 3: Air Quality		92	7	The text has been revised to incorporate parts of this suggestion.
Jason	West	I'm not sure I like the format of the BOX as it seems like an abstract of a published study. But it works ok. One problem with it is that the "Importance" section largely repeats things from the text. line 21 - "climate change will increase the frequency of weather patterns conducive to forming ground-level ozone" - This may be	Ch 3: Air Quality		92	17	The text has been revised to incorporate this suggestion. Due to the size of the topic, and the page limit for the chapter, we focused on broad causal terms rather than delving too deeply into specific elements of those causes. We believe the term "weather patterns" is clear and accurate.

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		true but it is not complete. Climate change also affects the transport and removal of ozone (not just formation). Some processes like temperature affecting reaction rates are better described as "weather" rather than "weather patterns".					
Jason	West	Clarify that reductions are "in the US" - there are several places in this chapter where this is left implicit, but it would be better stated explicitly, especially since these emissions will likely increase in some other places.	Ch 3: Air Quality		93	34	The text has been revised to incorporate this suggestion.
Jason	West	remove "the meteorological drivers of" -> "effects of climate change on ozone"	Ch 3: Air Quality		93	37	The text has been revised to incorporate this suggestion.
Jason	West	I'm surprised that you don't say more about the health effects of PM, like referencing the ACS studies or other strong evidence for this effect. I was expecting a paragraph at the end of the PM section as there was for ozone, but as effects of climate change on PM is less clear as for ozone, you could put that here.	Ch 3: Air Quality		93	30	The chapter focuses on characterizing the health impacts of climate-induced changes in ozone, and places relatively less emphasis on PM-related effects because of the special uncertainties associated with quantifying these outcomes.
Jason	West	"increasingly conducive to forming ozone" - climate change affects the transport and removal of ozone, not just the formation. Can just say "lead to higher ozone concentrations".	Ch 3: Air Quality		102	11	After consideration of this point, we still feel the existing text is clear and accurate. The additional text would alter the meaning of the sentence.
Jason	West	In the US or globally? Per year or accumulated over many years?	Ch 3: Air Quality		102	30	We addressed this comment for clarity
Paula	Schenck	1) Building and infrastructure effects include the possibility of significant exposure to mold and other bioaerosols after severe wet weather from both warmer weather storms and hurricanes, and winter storms with resulting roof ice dams and water incursion. 2) The amount of mold and other bioaerosol exposure encountered after severe wet weather events is possibly much larger than that encountered in usual indoor environments. Individuals who have not have had reactions before may respond to the increased amount.	Ch 3: Air Quality		98	30	The text has been revised to incorporate this suggestion.
Jason	West	I thought "Occasionally" was a little strange. It is true that there are transport events from the stratosphere, but I don't think they're that uncommon. The ozone from those events contributes to a tropospheric background, not just rare spikes.	Ch 3: Air Quality		90	32	After consideration of this point, we still feel the existing text is clear and accurate. In some locations (e.g., Eastern US) stratospheric intrusions impacting near-surface concentrations are quite rare, in other locations they're less rare.

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Jason	West	I'm not sure I understand what is meant by "indirect changes" - caused by climate change? or changes happening as stressors additional to climate change?	Ch 3: Air Quality		103	2	The text has been revised to incorporate this suggestion.
Jason	West	"between air pollutants and temperature" -> "between air pollutants and climate-related stressors, including temperature"	Ch 3: Air Quality		103	8	After consideration of this point, we still feel the existing text is clear and accurate.
Jason	West	Some references from my group that I think are relevant are listed here, although they tend to be global and not focused on the US: Silva, R. A., J. J. West, Y. Zhang, S. C. Anenberg, J.-F. Lamarque, D. T. Shindell, D. Bergmann, T. K. Berntsen, P. Cameron-Smith, W. J. Collins, S. J. Ghan, B. Josse, T. Nagashima, V. Naik, D. Plummer, J. M. Rodriguez, S. Szopa, and G. Zeng (2013) Global premature mortality due to anthropogenic outdoor air pollution and the contribution of past climate change, Environmental Research Letters, 8, 034005, 11 p., doi:10.1088/1748-9326/8/3/034005. West, J. J., S. Szopa, and D. A. Hauglustaine (2007) Human mortality effects of future concentrations of tropospheric ozone, Comptes rendus de l'Académie des sciences – Geoscience, 339: 775-783, doi: 10.1016/j.crte.2007.08.005	Ch 3: Air Quality		105	1	Thank you for suggesting these references. Because this report is focused on quantifying effect in the U.S., we do not believe these citations are directly relevant.
Paula	Schenck	1) The WHO 2009 review identified the need for research on immune effects from mold and moisture related bioaerosols in indoor environments. This is critically needed. 2) Considering anecdotal reports of “Katrina Cough” and “Sandy Cough” among clean-up workers, research is needed to define respiratory risks. Surveillance of storm recovery workers should be designed to include questions about exposure to mold. 3) Research is needed to develop improve tools for protection of the respiratory system and mucous membranes. Use of personal protective equipment is challenging in hot humid environments.	Ch 3: Air Quality		100	35	Thank you for your comment, but your suggestion is outside the scope of this report.

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Jason	West	<p>I think it would be relevant to have a discussion of the co-benefits of GHG reductions for air pollution and health effects. In the context of impacts discussed here, you could say something like:</p> <p>"Reducing GHG emissions to slow down climate change will not only decrease the impacts of future climate change on air quality, presented here, but would also reduce air pollutant emissions from the same sources as the GHGs. These co-benefits for human health have been shown to be substantial in comparison with the costs of GHG emissions. Further, the co-benefits derived from reductions in co-emitted air pollutants are expected to be greater than those from slowing climate change (West et al., 2013)."</p> <p>West, J. J., S. J. Smith, R. A. Silva, V. Naik, Y. Zhang, Z. Adelman, M. M. Fry, S. Anenberg, L. W. Horowitz, and J.-F. Lamarque (2013) Co-benefits of global greenhouse gas mitigation for future air quality and human health, <i>Nature Climate Change</i>, 3, 885-889, doi: 10.1038/NCLIMATE2009.</p>	Ch 3: Air Quality				Thank you for suggesting we include this literature, but the impacts of possible climate change mitigation approaches are outside the scope of this report. We have chosen not to include these citations because they do not directly support our goal of quantifying the health impacts attributable to climate change.
Juan	Declat-Barreto	<p>VIA Electronic Mail</p> <p>US Global Change Research Program</p> <p>1717 Pennsylvania Ave, NW, Suite 250</p> <p>Washington, D.C. 20006 USA</p> <p>E-mail: http://www.globalchange.gov/health-assessment</p>					We greatly appreciate your positive comment about our report and hope that you find the content useful. Graphic design elements will be used in the final report to make the research highlight sections easier to find, and to highlight their importance. Furthermore, a graphic has been added to the Executive Summary to help summarize the exposure pathways of the different chapters. Health surveillance data limitations are discussed in The Introduction chapter and the Technical Support Document (appendix). A new figure also describes varying areas where uncertainty in projecting climate impacts on health outcomes occurs (see Introduction chapter and the Technical Support Document Appendix). However, the report does not include policy or

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		<p>Re: Public Review Draft, The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment</p> <p>5 June 2015</p> <p>To the USGCRP:</p> <p>The Natural Resources Defense Council (NRDC) would like to offer these comments concerning the Public Review Draft, The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment.</p> <p>NRDC's staff represents public health, environmental policy and environmental science professionals with experience and expertise in climate change impacts, adaptation and preparedness planning and implementation, and in climate change policy guidance formulation.</p> <p>NRDC is among the nation's most effective environmental action organizations. We use law, science and the support of 1.4 million members and online activists to protect the planet's wildlife, wild places and ensure a safe and healthy environment for all living things. Founded in 1970 by a group of lawyers at the forefront of the environmental movement, NRDC attorneys helped write some of America's bedrock environmental laws. Today, our staff of more than 400 lawyers, scientists and policy experts work out of offices</p>					<p>adaptation recommendations, as these are beyond the defined scope of the assessment. The Executive Summary will be made into a shorter "highlights" version of the report for communication purposes, and efforts will be made in the development of the website and the graphic design and layout of the final report to ensure that readability for our main audiences is considered.</p>

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>in New York, Washington, Chicago, Los Angeles, San Francisco and Beijing.</p> <p>We would like to congratulate the USGCRP in producing this report to systematically assess the link between observed and projected changes to the climate, and associated human health impacts. The goals of the Report, "...to provide a comprehensive, evidence-based, and, where possible, quantitative estimation of observed and projected climate change related health impacts in the United States" (p. 23, lines 13-15), could not be more timely with the upcoming finalization of the first-ever standards to limit heat-trapping carbon pollution from power plants in the U.S. (Footnote 1) We hope these comments can help strengthen the readability and utility of the report, which describes more fully some of the harmful health impacts of climate change, the worst of which can be avoided by limiting carbon pollution and making climate-health preparedness a top priority.</p> <p>We would like to provide brief comment in several areas, including:</p> <ul style="list-style-type: none"> • Make the quantitative case study results more prominent. The case studies that illustrate climate-change quantitative estimates of health impacts and exposures are hard to locate in the Report. They are listed in the Preface (on p.24, lines 13-17), and include: Temperature-Related Death and Illness; Air Quality Impacts; Water-Related Illnesses; Vectorborne Disease; Food Safety, Nutrition, and Distribution; Extreme Weather; and Mental Health and Well-Being. Since this information is central to the Report and critically important to readers, it should be more evident throughout the Report and any associated materials, and made more prominent for readers. For example, a Table that compiles the quantitative findings and associated graphics in one easily-located 					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>section of the report would improve the accessibility of key findings for many readers.</p> <ul style="list-style-type: none"> • Highlight the need for climate-health tracking and environmental surveillance data, at comparable spatial and temporal scales. There is a lack of health surveillance data for many health outcomes that are being impacted by climate change (e.g., heat waves/extreme heat). Available health surveillance data are often mismatched in both spatial and temporal scales with reference to the relevant climate, weather, and natural and built environment data. The report should show how multi-agency surveillance and climate/weather/environmental data collection and sharing need to be improved and better coordinated in order to facilitate our ability to better estimate present and future burdens of climate effects on the nation’s health. <p>Two examples are:</p> <ul style="list-style-type: none"> ♣ Heat-Health Syndromic Surveillance systems are in place in several US cities and states that provide ways to rapidly assess the daily burden of extreme heat on community health. With climate change fueling increases in the frequency, intensity and duration of heat waves (Foonote 2), these syndromic surveillance systems can provide more communities with the means to inform and quickly evaluate levels of heat preparedness and response strategies that are needed (Foonote 3). The Report should briefly describe these syndromic heat surveillance systems as a case study, so that other locations and stakeholders can consider the benefits of their development and implementation. ♣ Daily aeroallergen monitoring and associated respiratory health outcome data are needed to more fully assess the climate-health risks of longer pollen production seasons, changes in allergenicity, and changing pollen concentrations associated with higher temperatures and higher atmospheric carbon dioxide concentrations. As noted on page 101, lines 18-24, “... with respect to research needs that focus on threats from exposures to aeroallergens, there are recognized gaps in disease surveillance and 					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>data collection, including measurements of daily aeroallergen concentrations; in monitoring and modeling aeroallergen and ecosystem dynamics across geographic and time scales; in understanding the synergistic effects from simultaneous exposure to aeroallergens and ambient air pollutants; and in improving methods for quantifying the costs of illnesses, including lost productivity (Reid and Gamble 2009; Beggs 2004, 2010; Canova et al. 2013; Cecchi et al. 2010; Kinney 2008; Selgrade et al. 2006).” Mapping studies have considered the co-occurrence of pollen-producing ragweed and unhealthy ozone exceedance days (Footnote 4), but developing monitoring networks that collect these data on comparable temporal and spatial scales would allow for better local assessments of climate-respiratory health effects.</p> <ul style="list-style-type: none"> • Streamline and organize the report to enhance its accessibility and utility for the intended user community. Although the report contains much useful information, it is overtly long and not highly accessible to many lay audiences. As stated on p.23, lines 16-18 of the Draft Report, the intended user community includes, “...public health officials, urban and disaster response planners, decision makers, and other stakeholders within and outside of government who are interested in better understanding the risks climate change presents to human health.” A shorter, summary version of the report for less technically-oriented users might include the excellent summary material from the Executive Summary, Chapter 1, and tables and graphics that summarize the quantitative findings. <p>Thank you for your consideration and the opportunity to submit these comments on the Public Review Draft.</p> <p>Respectfully,</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>Juan Declet-Barreto, PhD Climate and Health Science Fellow Climate and Clean Air Program Natural Resources Defense Council 1152 15th Street NW, Suite 300 Washington, DC 20005 Jdeclet-barreto@nrdc.org T 202.513.6268 F 202.289.1060</p> <p>Kim Knowlton, DrPH Senior Scientist, Science Center Deputy Director Natural Resources Defense Council 40 West 20th Street, 11th floor New York, NY 10011-4231 phone 212.727.4579; fax 212.727.1773 kknowlton@nrdc.org</p> <p>Footnotes</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>1. Environmental Protection Agency. 2014. Clean Power Plan Proposed Rule. http://www2.epa.gov/carbon-pollution-standards/clean-power-plan-proposed-rule. Last Accessed 6 June 2014.</p> <p>2. Meehl GA, Tebaldi C. 2004. More Intense, More Frequent, and Longer Lasting Heat Waves in the 21st Century. <i>Science</i> 305(5686):994-997 (13 August 2004), DOI: 10.1126/science.1098704 .</p> <p>3. Manangan AP, Uejio CK, Saha S, Schramm PJ, Marinucci GD, Brown CL, Hess JJ, and Luber G. Assessing health vulnerability to climate change: A guide for health departments. <i>Climate and Health Technical Report Series</i>, 2014. (Available at: http://wwwdev.cdc.gov/climateandhealth/pubs/AssessingHealthVulnerabilitytoClimateChange.pdf).</p> <p>4. DeClet-Barreto J, Alcorn S. 2015. Sneezing and Wheezing: How Climate Change Could Increase Ragweed Allergies, Air Pollution, and Asthma. <i>Natural Resources Defense Council (R:15-04-A, May 2015)</i>. (Available at: http://www.nrdc.org/globalwarming/sneezing/files/sneezing-report-2015.pdf).</p>					
Paula	Schenck	1) These populations are so stressed by socioeconomic factors that risks from indoor exposures to mold/bioaerosols (especially after severe weather events) maybe neglected, and consequently may become a significant threat to their health as biota proliferate with time if the environment is not addressed.	Ch 9: Populations of Concern		342	16	Potential indoor air quality issues have already been addressed in the chapter, so no change was made to the chapter text.
Mona	Sarfaty	I wish to point out that the following articles from the <i>Annals of the American Thoracic Society</i> and the <i>International Journal of Environmental Research in Public Health</i> are highly relevant and worth quoting in this chapter. They are an entirely different and confirmatory type of evidence for the material that is presented in the Chapter.	Ch 3: Air Quality				Thank you for suggesting we include this literature, but we have not chosen to include these citations because they do not directly support our goal of quantifying the health impacts attributable to climate change.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>Sarfaty M, Bloodhart B, Ewart G, Thurston GD, Balmes J, Guidotti TL, Maibach E. American Thoracic Society Member Survey on Climate Change and Health. Annals of the American Thoracic Society. Feb 2015. Vol 12 (2):274-278.</p> <p>Sarfaty M, Mitchell M, Bloodhart B, Maibach E. A Survey of African American Physicians on the Health Effects of Climate Change. Int. J. Environ. Res. Public Health 2014, 11(12). 12473-12485.</p>					
Mona	Sarfaty	<p>For evidence on physician experience with these effect please see the following documentation of physician experience with heat related problems. There are useful qualitative as well as quantitative results.</p> <p>Sarfaty M, Bloodhart B, Ewart G, Thurston GD, Balmes J, Guidotti TL, Maibach E. American Thoracic Society Member Survey on Climate Change and Health. Annals of the American Thoracic Society. Feb 2015. Vol 12 (2):274-278.</p> <p>Sarfaty M, Mitchell M, Bloodhart B, Maibach E. A Survey of African American Physicians on the Health Effects of Climate Change. Int. J. Environ. Res. Public Health 2014, 11(12). 12473-12485.</p>	Ch 2: Temperature-Related Impacts				Addressing the physician experience with these effects is currently beyond the scope of the chapter given space/length constraints. No change has been made to the text.
Mona	Sarfaty	<p>For evidence on physician experience with these impacts please see the following survey documentation of physician experience with extreme events. There are useful qualitative as well as quantitative results. This is an additional type of evidence which has proven noteworthy in getting much needed public attention to the problem.</p>	Ch 7: Extreme Events				We appreciate the suggestion with additional references; however, space is limited. The author team has deliberated and agreed on the most important information and illustrations to include. The authors have decided to not include a more in-depth mention of physician experience with impacts of extreme events and

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>Sarfaty M, Bloodhart B, Ewart G, Thurston GD, Balmes J, Guidotti TL, Maibach E. American Thoracic Society Member Survey on Climate Change and Health. Annals of the American Thoracic Society. Feb 2015. Vol 12 (2):274-278.</p> <p>Sarfaty M, Mitchell M, Bloodhart B, Maibach E. A Survey of African American Physicians on the Health Effects of Climate Change. Int. J. Environ. Res. Public Health 2014, 11(12). 12473-12485.</p>					related citations. No change has been made to the text.
Jeanne	Leffers	<p>Executive summary</p> <p>I believe that the Executive Summary is very well done overall. The explanations and graphics are very helpful to the reader. I have some specific comments below.</p> <p>Page 4 graphic</p> <p>Overall I think that the graphic is a helpful illustration to show the interaction of existing factors with the actual climate change pattern. However, on the right side, social determinants of health there is an issue. It is taken from the WHO Social Determinants of Health and Health Inequities framework so it is a merger of several perspectives. Age, gender, race and ethnicity are not social determinants but often immutable factors that interact with social factors. While there are social implications they are biologic or social categories. So, the title should be Social Determinants of Health and Health Inequities to reflect the inclusion of this broader</p>	Executive Summary				We greatly appreciate your positive comment about our report and hope that you find the content useful. The exposure pathway figures in the executive summary and underlying chapters have all been reviewed and revised, including changes in the format and titles. A description of how to read these diagrams has been added to the Front matter. Please see chapter on Populations of Concern section on children and pregnant women for specific comments on fetal health.

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		<p>focus—or revise to fit the Social Determinants of Health framework.</p> <p>Page 19 Vulnerability</p> <p>For the populations of concern, in particular the vulnerability of the fetus and children are distinct from the other categories for the reason of developmental differences. Please refer to the studies that always used average size white males in the sample and how skewed that data was. While there is variability on all the populations of concern, I think a sentence or two that reminds the reader of the uniqueness of the fetus, infant and small child is very important.</p>					
Jeanne	Leffers	<p>Chapter 1 Climate and Health</p> <p>Page 28 line 12 reads “People within that city who are poor or have underlying health conditions may have heightened vulnerability.” I think it should also mention that the fetus, infants and children due to their developing organ systems and behavioral factors are at more risk to such stressors.</p> <p>Line 25 ff where it says “Climate change can therefore affect human health in two main ways: first, by changing the severity or frequency of health problems that are already affected by climate and/or weather factors; and second, by creating unprecedented or unanticipated health problems or health threats in places where they have not previously occurred”, I believe should include developmental stages. By this I mean that during some critical stages of development we might not consider it a health problem</p>	Executive Summary				<p>No text has been changed in the executive summary, but underlying text in the introduction chapter and the chapter on populations of concern has been revised for clarity. Please see the section on Children and pregnant women in the chapter on populations of concern for more specific treatment of vulnerabilities of children (at different developmental stages) and pregnant women.</p>

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		<p>but certainly a time where existing development can be impacted to express the “problem”.</p> <p>On page 37 in the discussion of modeling, I am not sure where to put it but I think that there should be a statement that reflects how the models deal with body mass/size to make comparisons—again the issue of studies done only on male adults.</p>					
Jeanne	Leffers	<p>Chapter 6 Food safety</p> <p>Page 216. Somewhere there should be a statement about the increased risk to fetus, infants and children as a result of foodborne illness that causes diarrhea and dehydration in children. Also on the chart of page 216 where it speaks of various causative agents I see e.coli but no specific mention of the risk of uremic syndrome—especially in children from e.coli 0157. There may be other more severe effects of other agents upon children as well.</p> <p>Page 218, 219 applaud content that speaks to risk of aflatoxins, methylmercury upon the development of children but I would like to see something under pesticides and their impact upon children and future generations.</p> <p>Nutrition section 221-222 needs to have information about children as high-risk group for both protein and micronutrient deficiency due to developing brain.</p> <p>222-223 under distribution, and access, there are two concerns for the infant. First, those who are breastfed while they might be safe if they are with their mother and she can maintain adequate milk supply (in heat related event) but there is a concern for the safety refrigerated or frozen breast milk. For those infants who are bottle</p>	Ch 6: Food Safety				<p>In regards to children’s susceptibility to E. coli, the authors note that while children are not necessarily more susceptible to E. coli exposure, they are more susceptible to severe infection or complications than adults. Thus, a sentence has been included in this chapter’s section on populations of concern noting the higher risk of complications like hemolytic uremic syndrome. References have also been added to this section in regards to exposure to pesticides in the children of agricultural workers. The commenter’s concerns regarding breast milk and neurological development does not have strong support for health impacts in the United States, and may represent more of an emerging global health concern. Health impacts specific to children are also covered in Chapter 9: Populations of Concern.</p>

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		fed, there is great concern about access to safe water to mix formula, for sterilization of bottles and for refrigeration of formula. This concern could also be added to section 6.6 under populations of concern.					
Jeanne	Leffers	<p>Chapter 9 Climate health risk factors and populations of concern</p> <p>Pg. 339 Figure 2</p> <p>The social determinants of health does not usually include the “individual characteristics (such as gender, education, occupation, income, and ethnicity)” noted in the World Health Organization’s (WHO) Social Determinants of Health and 8 Health Inequities Framework as this framework is broader. While it is true that there is interaction between what are generally considered the social determinants (where one lives, works, learns etc) as context and individual characteristics to be clear the title should include both social determinants and health inequities.</p> <p>Pg. 340 line 20 mentions the immature immunes system of the child but I would like to see not only the example of allergen but to the chemicals in altered exposures in food, water etc due to immature liver and kidney to excrete chemicals.</p> <p>Page 345 Section 9.4.3 is very important and I would like to see more information to highlight the immature physiology and metabolism for children. While the intake of air, food and water is mentioned there is limited explanation. The report should say why this intake increases their exposures, the role of metabolism and excretion and the hazards of increased exposures to toxins. A bit</p>	Ch 6: Food Safety				<p>The text has been revised to incorporate these suggestions.</p> <p>We have completely revised Figure 2 in response to this and other comments. It now focuses on how the Social Determinants of Health feed into the Elements of Vulnerability to ultimately affect health outcomes. Social cohesion is a component of the Social Determinants of Health. We have also added illustrative examples to help explain the points.</p> <p>We have added text to address emerging issues with respect to vulnerable children.</p> <p>We added some language to discuss how the immature immune systems of children contribute to food and water exposures of toxic chemicals.</p> <p>We added more information on children’s physiology and metabolism and exposure in the Children’s Health section.</p> <p>We have already discussed infants and small children and heat as well as the risk to the fetus.</p> <p>We have discussed how increased exposures, the role of metabolism and the hazards of exposures are exacerbated by behaviors that may increase vulnerability (such as hand to mouth behaviors and playing outdoors).</p>

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		<p>more about the types of behaviors would be helpful (hand to mouth, playing outdoors in dirt and grass, etc).</p> <p>Page 345 extreme heat</p> <p>While this mentions the risk to athletes I believe that it should most definitely speak to infants and small children as well. In addition, the increased risk of premature delivery in heat events should be mentioned here (it appears on page 346 line 34).</p> <p>Page 346 section on water-borne illness. Is there data for those who have wells and contamination from extreme weather events? As in Chapter 6 I see an issue of contaminated water for formula for infants.</p> <p>Page 347—foodborne illness. Food storage for formula or frozen breast milk after power outage.</p> <p>Figure 2 page 386 really does not depict social determinants or issues such as discrimination, non-chemical stressors or the social isolation of communities such as we saw with Hurricane Katrina</p> <p>Figure 3 page 387</p> <p>Lacks discussion of increased toxic chemical exposures through food and water affected by weather events (run off etc)</p>					<p>Figure 2 is undergoing extensive revision to better convey the social determinants of health.</p> <p>As to Figure 3 page 387: Figure is meant to convey differences related to children's lifestages. The authors have revised this figure to better express the suggested content.</p>

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Leonard	Trasande	I strongly endorse the American Academy of Pediatrics statement on the Scientific Assessment. Children are uniquely vulnerable to the effects of climate change, for reasons rooted in their biology. Proactive efforts to prevent further climate change are likely to produce substantial long-term health and economic benefits that are vastly underrecognized and underappreciated.					We greatly appreciate your positive comment about our report and hope that you find the content useful.
John	Herrmann	<p>Thank you for the opportunity to comment on the April 7, 2015 draft Impacts of Climate Change on Human Health in the United States: A Scientific Assessment (the “report”) by the US Global Change Research Program (USGCRP) Climate and Health Assessment. Our comments below do not review the report’s findings and analysis systematically, but provide examples of problems found repeatedly. In summary, we find the report uses inconsistent outcome metrics in its findings and does not use risk assessment terms consistent with established practice. These problems sow confusion and contribute to the report’s highly unlikely findings.</p> <p>We also note that the report is not consistent with, or follow the approach of, the World Health Organization when it examined the same policy question. By including quantified estimates, by using a consistent and transparent analytic framework across adverse effects, by comparing across all diseases, and by considering adaptive capacity in part, the WHO analysis offers more actionable and relevant information to the public and policy officials.</p> <p>Most importantly, we also had hoped that the USGCRP would address the flawed approach of excluding adaptive measures that it has used for many years, but are disappointed to find another rehashing of static trends. USGCRP’s draft states that “[c]limate change is a significant threat to the health of the American people,” but it does not take into account adaptation, which is the fatal flaw to the utility of the report. To be more useful to the public and to policy officials, the report should focus instead on how current and future adaptation practices and capacities may address potential human health risk.</p> <p>METHODOLOGICAL PROBLEMS</p> <p>The report should have a consistent definition, presentation, and</p>					<p>This report was developed by USGCRP’s Interagency Group on Climate Change and Human Health as part of the sustained National Climate Assessment and as called for under the President’s Climate Action Plan. The National Climate Assessment has been mandated by Congress since 1990. Descriptions of the use of likelihood and confidence language are in the Front Matter, the introduction chapter, in detail in the Technical Support Document and Appendix on Likelihood and Confidence, and in every chapter’s Traceable Accounts. Front matter and an appendix also describes the process for drafting the report. All Key Findings and Traceable Accounts have been reviewed for consistency in use of likelihood and confidence language., as outlined the Introduction chapter, the Front Matter, and the appendix on likelihood and confidence. The assessment does not include detailed discussions of climate mitigation, adaptation, or economic valuation. Consideration of greenhouse gas emissions pathways and human adaptive capacity (see also Front Matter and Introduction chapter) has been included as appropriate, and where it occurs in the underlying literature being assessed, to assess climate change impacts on human health. The final report also includes a glossary. In addition, risk, vulnerability, exposure, and adaptive capacity are all defined in both the introduction chapter and the chapter on Populations of Concern. The scope of the assessment is focused on impacts in the United</p>

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		<p>analysis of terms such as “risk,” “hazard,” and “vulnerability.” Once the analysis is consistent, it should analyze vulnerabilities by including the United States’ ability to adapt to a changing climate. Each of these issues is discussed below.</p> <p>Inconsistent and Flawed Description of Hazards, Risk, Outcomes, and Treatment of Adaptation</p> <p>The report is inconsistent as to whether adaptation is included in its analysis of potential health effects. As discussed above, the report states that a detailed assessment of adaptation is outside the scope of the assessment. However, in its definition and presentation of “vulnerability,” adaptation is a key component. For example, in Figure ES9, adaptive capacity and risk are the two contributors to “vulnerability.” The key findings for Climate-Health Risk Factors and Populations of Concern are presented as “Vulnerabilities,” even though adaptive capacity is not included.</p> <p>This inconsistency is not merely linguistic, but symptomatic of analytic flaws. First, there is only one section of findings that uses the term “vulnerabilities;” other sections of the findings discuss “risk,” “consequences,” “impacts,” and “deaths.” There is no reason presented for using different outcome measures and presumably different analytic frameworks. Including different analytic frameworks renders comparison across the findings difficult and prone to misinterpretation. The report should adopt consistent analytic frameworks that estimate the hazard, the risk, and the likely outcomes, given the interaction between the potential hazard and adaptive capacity.</p> <p>The report also uses a definition of risk that is not standard in the risk assessment community. In the conventional risk assessment paradigm set forth by the National Academies of Science, “risk” is the probabilistic combination of “hazard” (hazard identification and dose-response) and “exposure” (exposure assessment and risk characterization). The report uses “exposure” more in the sense of hazard as in this finding:</p> <p>Key Finding 1: Although there are many practices to safeguard food in the United States, climate change, including rising</p>					<p>States (as stated in the Front Matter (preface) and Executive Summary). The NRC peer review is conducted independently from the authors of the report and follow NAS guidelines.</p>

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		<p>temperatures and changes in weather extremes, is expected to intensify pathogen and toxin exposure [Likely, High Confidence], increasing the risk, if not the actual incidence, of foodborne illness [Medium Confidence].</p> <p>The confusion between exposure and hazard stands out in this statement. While increasing temperatures may increase the levels of pathogens in food, this increased hazard may not translate to increased exposure, risk, and incidences. Our multiple levels of food sanitation, transportation, storage, and preparation may adequately reduce exposure to pathogenic hazards, regardless of the level of hazard. The report should use well-defined terms such as “risk” consistent with their established frameworks so as not to confuse the public and policy officials.</p> <p>The confusion is deepened when the report mixes in its uncertainty descriptions. The report states that the above statement is “likely,” which according to the report means there is a greater than 2/3 chance of it occurring according to expert judgment. It is unclear what is “likely” in this statement given above. The likelihood indicator goes before “exposure,” but not “risk” in the statement. The report must be making a distinction between the two. Since principal protection against risk is risk management, the report appears to conclude that our food safety system – and its ability to adapt – reduces the likelihood of increased public health harm. If the report is backhandedly considering adaptive capacity in its confidence statements, this oblique approach is unclear and inconsistently applied in the draft report.</p> <p>We also note that there is no methodology provided to describe how these experts arrived at these estimates of likelihood or of uncertainty or how these determinations could be reproduced. To be consistent with scientific principles, the report should detail the methodology and results of the uncertainty statements.</p> <p>Inconsistent Application in the Report Yields Vacuous and Highly Unlikely Outcomes</p> <p>The inconsistent terms and the inconsistent analytic framework lead to self-evident problems with the findings. First, some are</p>					

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		<p>obvious and have no particular relationship to climate change effects. For example, in the statements of vulnerability, the report finds:</p> <p>Key Finding 1: Across the United States, people and communities differ in their exposures, their inherent sensitivity, and their adaptive capacity that enables them to respond to and to cope with climate change related health threats. Vulnerability to climate change varies across time and geographic areas, across communities, and among individuals within communities [Very High Confidence].</p> <p>One could substitute “rattlesnakes” or “zombies” for “climate change related health effects” without altering the statement’s veracity and import. In fact, all of the vulnerability statements suffer from being self-evident descriptions of baseline public health conditions and human physiology. Baseline descriptions could be useful for quantitative analysis of change. However, as discussed above, this section of the report describes “vulnerabilities” without assessing adaptive capacity or quantifying potential adverse public health harms.</p> <p>Similarly, other findings give highly unlikely outcomes due to the failure to consider adaptation. To illustrate this systematic problem in the report, we consider two examples concerning food availability and drinking water safety. For food safety, the report finds:</p> <p>Key Finding 4: Increases in the frequency or intensity of some extreme weather events associated with climate change may increase disruptions of food distribution by damaging existing infrastructure or slowing shipments. These impediments may lead to food damage, spoilage, or contamination, which may limit availability and access to safe and nutritious food [Medium Confidence].</p> <p>First, the confidence is “medium” in a statement where the verb is “may lead to.” It is hard to know how to interpret how one could only have a medium level of confidence in a statement that is uncertain in both whether it is causal or the magnitude of the</p>					

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		<p>causality. Is the report saying that there is also medium confidence that climate change “may not lead to” any causation or expected value outcome?</p> <p>Second, putting aside the words, the concept is implausible on its face. While extreme weather may temporarily disrupt and destroy food stocks in a region, helicopters, trucks, aircraft, and numerous other means can move excess U.S. food stocks to affected regions. The United States can also rely on a global trade in food during an emergency. Further, in a dynamic economy, food production and processing can move away from routinely affected areas or adapt to protect against weather extremes (e.g., Alaskan canneries and Florida fruit producers). Adaptive capacity is key; the report does not demonstrate that climate change and extreme events could overwhelm our transportation and markets routinely to affect population nutrition. To posit that the United States could suffer a limitation of safe and nutritious food over any sustained period to cause adverse public health flies in the face of history.</p> <p>Similarly, the report’s inconsistent approach to adaptability for drinking water safety gives a finding that is a highly unlikely outcome. The report’s findings state:</p> <p>Key Finding 3: Increases in some extreme weather events and storm surge will increase the risk of failure of, or damage to, water infrastructure for drinking water, wastewater, and stormwater [Medium Confidence]. Aging infrastructure is particularly susceptible to failure. A breakdown in water infrastructure would contribute to increased risk of exposure to water-related pathogens, chemicals, and algal toxins.</p> <p>This text in the finding ignores the overarching conclusion of adaptation found in the main text of the report. The report properly states, “If drinking water is appropriately treated, climate change is not expected to substantially increase the risk of contracting water-related illness.”</p> <p>This statement is informed by our adaptive capacity. Our current public drinking water system can respond to increased biological threats. Public water systems today provide safe and affordable</p>					

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		<p>drinking water to populations living in much warmer climates than typical for the United States. Cities like Singapore, Hong Kong, Brisbane, Tel Aviv, and others are examples. Even if our public water systems are stressed or if somehow food has fewer nutrients, it is hard to image that we would not divert additional resources to maintain safe public drinking water and a nutritious and abundant food supply. We would not suddenly throw out nearly 150 years of advances in public health understanding and bear increases in disease and malnutrition. The least likely scenario is the one given as a finding of the assessment - that we would let public health be adversely affected by not managing any (potential) increased risk.</p> <p>Vulnerability Assessment (including Adaptation) of Most Value to the Public and Policy Officials</p> <p>The final report should expand the current vulnerability assessment to include all sections. As the report states, a vulnerability assessment must include an assessment of adaptive capacity. As shown by the report’s inconsistent treatment of potential risk to drinking water safety, listing hazards without assessing their likelihood is misleading. The key findings of this report fly in the face of centuries of real-world innovation and adaptation such as the fact that as the U.S. electric grid was built out and air conditioning became affordable for most Americans, tens of millions (net) Americans have intentionally migrated away from northern climes into the southern “Sunbelt” states and voluntarily increased the average American’s temperature exposure well beyond any projected under the IPCC scenarios. And, all recent demographic statistics suggest these trends will continue.</p> <p>We point out that valid and more accurate analytic frameworks to analyze risk and policy options exist in OMB Circulars, Executive orders, National Academy of Sciences reports, and Federal agency guidance documents. We recommend the final report adopt one or multiple of these established frameworks so that its terms and analysis are internally consistent and comparable to other public health assessments.</p>					

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		<p>METRIC IS NOT COMPARABLE TO OTHER PUBLIC HEALTH RISKS AND TO POSSIBLE INTERVENTIONS AND TO ADAPTATION STRATEGIES</p> <p>We recommend any quantified estimate of health impact throughout the report be measured in consistent metrics that incorporate the reduction in life span and any morbidity. The potential consequences in the report affect different ages of the population and have different levels of severity. The report should use the best practices in the field to present these disparate effects in a common metric. The public would also benefit from a standardized presentation of potential adverse health effects.</p> <p>Some of the reports most alarming and quantified results illustrate the problem of using a metric that is misleading and very limited for public policy response:</p> <p>Key Finding 1: Future climate warming could lead to thousands to tens of thousands of additional deaths each year from heat in the summer, as calculated by extrapolating statistical relationships and without considering potential adaptive changes [Very Likely, High Confidence].</p> <p>To say “thousands” of additional deaths ignores the fundamental truth that we all must die of something and at some time. There cannot be thousands “more” deaths since each one of us can only die once. The report presumably means that more people will die sooner than expected due to extreme temperature events. A better metric for this type of public health effect considers how much quantity and quality of life a disease takes from the population. EPA, other Federal agencies, the Institute of Medicine, and the World Health Organization (WHO) find “years of life lost” (YLL) or disability-adjusted life-years (DALYs) or other health-weighted life-year metrics are more useful tools.</p> <p>These tools are useful because they allow analysts to compare the relative health impact of diseases with very different incidences and effects. A disease that can be fatal to children (e.g., cholera, measles) but is rare may have similar YLLs in a population as a more common diseases affecting older members (e.g., cancer). In</p>					

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		<p>addition, using YLL allows policy officials to evaluate different public health measures and evaluate their outcomes. Using a common metric like YLL, public health officials can compare very different public health interventions (e.g., increased vaccination education campaign and benefit the population the most. This tool is especially useful for an issue like climate change that will have multiple and complex impacts on different diseases. The final report should shift to metric that better captures this complexity in population mortality and morbidity.</p> <p>Own Evidence Spotty, Incomplete, and Inconsistent with other Analyses</p> <p>In addition to a misleading metric, the report's data analysis of temperature-related deaths is selective, not systematic, and inexplicably inconsistent with other analyses and not representative for the United States. The WHO has considered how climate change can change the global burden of disease, including in North America. The WHO analysis differs from the report's analysis in several key ways:</p> <ul style="list-style-type: none"> • Reduction in life years lost to cardiovascular disease from reduced cold weather. The WHO report considered both reduced direct mortality from cardiovascular causes during cold weather and increased direct death rates from heat waves. By evaluating the literature, the WHO concluded that overall net effect is estimated to be small, an increase in relative risk of 1.003 by 2030. Under certain modeling scenarios, the reductions of cold-weather risk is greater than the increased warm-weather direct effects, reducing the relative risk. • Adaptation over time to rising temperatures mitigating increased mortality from warmer annual temperatures. One mitigating effect that the WHO cites is the ability of a human population to adapt to changing climate over time. This observation explains why healthy populations can exist in very different climates (e.g., northern Scandinavia and Tel Aviv and Perth). While the report mentions this consideration, it does not appear to give it the same weight as the WHO. 					

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		<p>• Increased risk to water-borne diseases. Like the report, the WHO analysis recognizes that increase pathogens in drinking water is a hazard from rising temperatures. Tropical cities face greater pathogenic drinking water risks than more mild temperature cities. However, with over 150 years of public sanitation experience on protecting drinking water, we have the ability to adapt and to protect from an increased hazard. The WHO agrees and concludes that developed economies' populations will not face any increased risk from water-borne diseases.</p> <p>The WHO analysis provides a more complete description of the literature than the report does. The report does not even cite the WHO analysis or many of the studies cited by the WHO. If the report concluded that the WHO analysis has been replaced by more recent analysis, it should explain the basis for this conclusion. Without such an explanation, this omission raises concerns with the report's review of the available literature. The final report should reconcile its analysis as compared to the WHO report and conduct a systematic review of the literature so that key studies are not omitted. Moreover, it is significant to note that the WHO report was based on the IPCC's Third Assessment in 2001, which projected a temperature increase of 1.4-5.8 degrees Celsius from 1990-2100; since that time, the IPCC has issued its Fifth Assessment in 2014, which projects future warming to be 0.3-4.8 degrees Celsius by 2100, significantly less than projected in 2001. This trend means any WHO update of its analysis should find even lower potential impacts to public health from climate change in the United States. USGCRP should determine if WHO has any updates planned to incorporate the lower projected temperature increases and examine the literature for new studies published since the Fifth Assessment which find even lower projected temperature increases, including a recent study by Lewis and Curry (2014) that provides solid peer-reviewed evidence showing that the underlying forcing and heat uptake estimates in AR5 support narrower 'likely' ranges of temperature increases and with far lower upper limits than the Fifth Assessment.</p> <p>The final report should reconcile its findings, statements, and analysis with those of other public health organizations and with the global public health experience. Again, we believe much of the</p>					

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		<p>report's inconsistencies stem from a sloppy analytic framework and inconsistent consideration of adaptive capacity.</p> <p>The WHO Studied Climate Change as a New Burden on Global Health</p> <p>The good news is that better analytic frameworks exist and have been applied to the same question addressed by the report. The WHO has undertaken a long-running project to estimate the global burden of disease and to put the findings in a common metric of YLL. The current results of this project offer some perspectives on the report's findings and framework.</p> <p>Global Burden of Disease Findings</p> <p>The overarching future trend is for a healthier, wealthier world (and United States). The WHO projects that one of the major reasons for the projected decline in global disease burden from 2010 to 2030 will be increased wealth. This finding is supported by the work of other organizations; The World Bank has published correlations between population wealth and population health. The USGCRP report, however, ignores the role of income on population health. In the timeframe of the draft report's projections, US society will become significantly wealthier and healthier than it is today. As we become healthier and wealthier, our adaptive capacity will increase. Therefore, as the report is revised to include adaptive capacity, this adaptive capacity should increase over the report's analytic timeframe to correspond to the WHO and World Bank findings.</p> <p>Within its Global Burden of Disease project, the WHO used a more complete and comprehensive methodology to estimate the impact of climate change on public health. The WHO found that climate change add relatively little to global disease burden in comparison to well-known scourges like heart attacks, cancer, and road accidents. The greatest current disease burden associated with climate change is cardiovascular disease; however, climate change will reduce the YLL from this disease. Waterborne illnesses are also relatively highly ranked in 2010; however, as the WHO concludes, the vast majority of this burden occurs in developing</p>					

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		<p>countries, not in the U.S.—where the USGCRP is supposed to be focused.</p> <p>When examining climate change in particular, the WHO finds North America and East Asian developed countries to suffer the least global burden in YLL. In 2000, the WHO finds North America lost 4,000 life-years due to climate change. In comparison, the US region lost 2,000 times more YLL from heart disease and 460 times more from road accidents.</p> <p>Our point from the WHO report is that much better tools and analysis exist to estimate the hazard than found in the report. By including quantified estimates, by using a consistent and transparent analytic framework across adverse effects, by comparing across all diseases, and by considering adaptive capacity in part, the WHO analysis offers more actionable and relevant information to the public and policy officials. The final report should build on the WHO’s strong foundation. The final report could address limitations in the WHO analysis and use updated information on estimated future climate, national income, public health conditions, and casual links between climate and disease.</p> <p>Problems with Proposed Review Process</p> <p>The Federal Register notice states: “The report will undergo peer review by the National Research Council of the National Academy of Sciences.” We note that members of the NAS committee tasked with reviewing this report are repeatedly cited in the report itself. A cursory review of the citations in the report includes these from the NAS committee tasked with reviewing the report:</p> <p>Ben Zaitchik:</p> <p>Page 77, Line#7, 2014: Heat Waves and Health Outcomes in Alabama(USA): The Importance of Heat Wave Definition</p> <p>Page 80, Line#6: 2012: Heat waves in the United States: definitions, patterns, and trends</p>					

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		<p>Page 373, Line#1: 2014: Heat Waves and Health Outcomes in Alabama(USA): The Importance of Heat Wave Definition</p> <p>Chris Portier:</p> <p>Page 219, Line#31(Portier et al. 2010)</p> <p>Page 240, Line #25: 2010: A Human Health Perspective on Climate Change: A report outlining the research needs on the human health effects of climate change.</p> <p>Cristina Tirado</p> <p>Page 216, Line#1 (Tirado et al. 2010)</p> <p>Page 220, Line#10 (Tirado et al. 2010)</p> <p>Page 227, Line#29 (Tirado et al. 2010)</p> <p>Page 235, Line#38: 2008: Climate Change: Implications for Food Safety</p> <p>Page 242, Line#29: 2010: Climate change and food safety: A Review.</p> <p>The NAS has procedures and policies for when panel members review their own research. We expect that the NAS to ensure its panels adhere to these policies and procedures during the review of the report.</p> <p>Conclusion</p> <p>As discussed above, these comments are not a systematic review of the report's flaws. We cite examples in these comments to point out the importance of our main recommendations: the final report must improve its data analysis, its analytic rigor, and transparency. It must consistently include how potential climate change related public health hazards can be mediated through available adaptive capacities in the U.S. public health system and the U.S. economy. These changes should be carried out throughout the report. Unlike</p>					

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		the draft report, the final report should not shout shrill alarms, but provide a reasoned scientific assessment to inform the public and leaders.					
Matt	Hall	<p>June 8, 2015</p> <p>Ms. Allison Crimmins, Coordinator USGCRP Climate and Health Assessment Environmental Protection Agency 1200 Pennsylvania Ave. NW. (6207-A) Washington, DC 20460</p> <p>Comments submitted electronically only</p> <p>Re: Consumers Energy Company Comments on the United States Global Change Research Program (USGCRP) Draft Impacts of Climate Change on Human Health in the United States: A Scientific Assessment</p> <p>Dear Ms. Crimmins:</p> <p>Consumers Energy Company appreciates the opportunity to submit comments on the USGCRP's Draft Scientific Assessment. Consumers Energy is one of the nation's largest combined gas and electric utilities. We serve 6.8 million of Michigan's 10 million</p>					<p>After consideration of this point, we feel the existing text is clear and accurate. The chapter identifies that there are two major factors which will affect future ozone levels: 1) trends of precursor emissions and 2) climate-driven impacts. The chapter is clear that this report is not looking at the total of both factors but only the second factor.</p> <p>The reviewer's discussion of air quality standards, regulations, and trends is off topic with respect to analyzing aeroallergen trends and associated respiratory illnesses among populations of concern.</p>

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		<p>residents. We are members of the Utility Air Regulatory Group (UARG) and incorporate their comments by reference.</p> <p>Upon reviewing the report, one conclusion in particular in the Draft Scientific Assessment stood out. The USGCRP states as Air Quality Impacts Key Finding 1 (See Draft Scientific Assessment: Executive Summary, page 7 at line 12.):</p> <p>“Changes to the climate will tend to make it harder for any given regulatory approach to reduce ground-level ozone pollution in the future as meteorological conditions become increasingly conducive to forming ozone over most of the United States. Unless offset by additional emissions reductions, these climate-driven increases in ozone will cause premature deaths, hospital visits, lost school days, and acute respiratory symptoms.”</p> <p>The accompanying Figure ES3 indicates that climate change based increases of 1 to 5 parts per billion (ppb) in average daily 8-hour maximum ozone levels will be observed. The USGCRP addresses the research that led to the Air Quality Impacts Key Finding 1 in Chapter 3: Air Quality. Chapter 3 appropriately discusses the relationship between ozone precursor emissions and certain meteorological conditions that results in the formation of ground level ozone (See Chapter 3: Air Quality, Section 3.3.1 beginning on page 89.). Chapter 3 continues to describe the USGCRP ozone models and, while they admit their chosen modeling results are “subject to important uncertainties and limitations, (See Chapter 3: Air Quality, Section 3.3.1 page 93, line 14.)” reach the conclusion that the United States are likely to see increases in the average daily 8-hour ozone maximum levels (See Chapter 3: Air Quality, Section 3.3.1 page 92, line 35.).</p>					

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		<p>Consumers Energy’s concern with this draft report’s conclusion is that the repeated statement on a likely increase in maximum ozone levels is based on a completely inappropriate assumption that emissions of ozone precursors will remain static (See Chapter 3: Air Quality, Section 3.3.1 page 93, line 16); an assumption that USGCRP admits is not representative of the future (See Chapter 3: Air Quality, Section 3.3.1 page 89, line 36).</p> <p>There is no justification for carrying static ozone precursor input modeling data forward in order to call for additional ozone reductions. Any predictive models for public health impact analysis should make use of both expected changes in weather/meteorological patterns and the well documented and expected decline of emission rates of ozone precursors.</p> <p>There is an overwhelming universe of data that clearly shows levels of ozone precursors from Electric Generating Units (EGUs), and mobile sources, continue to fall. The U.S. Environmental Protection Agency (EPA) itself makes the following statement, “Nationally, average ozone levels declined in the 1980’s, leveled off in the 1990’s, and showed a notable decline after 2002” (http://www.epa.gov/airtrends/ozone.html). Furthermore, EPA accompanies that discussion with a graphic that shows a 33% decrease in national average ozone monitor readings from 1980 to 2013. Additional coal-fired EGU controls and closures post-2013 have and will occur due to the Mercury & Air Toxics Standards (MATS) rule, the proposed Clean Power Plan (CPP) regulating greenhouse gases at existing EGUs, and unit age. Thus, it is safe to conclude that ozone precursors from these sources will continue to diminish, not remain static at near 2000 levels.</p>					

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		<p>Furthermore, EPA is currently evaluating comments it received as part of their proposal to revise the existing ozone National Ambient Air Quality Standard (NAAQS). Their proposal is to reduce the existing 75 ppb standard to one in the range of 65 to 70 ppb. In the proposal’s accompanying Regulatory Impact Analysis (RIA), EPA identifies a host of existing regulations that is driving ongoing compliance with the existing ozone NAAQS (http://www.epa.gov/ttn/ecas/regdata/RIAs/20141125ria.pdf, beginning at page 1-6.). This list includes multiple regulations targeting EGU and industrial fossil fuel combustion sources, as well as multiple regulations targeting mobile source combustions emissions (ex. Tier 3 Motor Vehicle Emission and Fuel Standards (U.S. EPA, 2014c)). The RIA goes on to identify those consistent decreases in ozone levels, stating (http://www.epa.gov/ttn/ecas/regdata/RIAs/20141125ria.pdf, beginning at page 2-7.):</p> <p>“The decreasing trend is especially sharp from 2002 to 2004, when EPA implemented the “NOX SIP Call”, a program designed to reduce summertime emissions of NOX in the eastern U.S., but has continued to decrease since then, in part due to ongoing reductions in mobile source NOx emissions.”</p> <p>EPA includes an accompanying graphic – attached below –that clearly shows a decreasing trend in ozone monitored values. (See Figure 2-2: Trend in U.S. Annual 4th Highest Daily Maximum 8-hour Ozone Concentrations in ppb, 200-2013.</p> <p>With the overwhelming data showing that monitored ozone levels across the United States are clearly decreasing, the USGCRP’s modeling analysis, and their resulting statements on climate change driving a 1 to 5 ppb increase in ozone levels, based on static ozone</p>					

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		<p>precursor emissions, is incorrect and results in misleading and inaccurate modeling results.</p> <p>There is no basis for publishing definitive statements on matters of future public health when the underlying research/modeling is fundamentally flawed. Consumers Energy respectfully requests that the USGCRP remove these flawed conclusions from their final publication on impacts of climate change on human health. Any conclusions USGCRP wishes to make on climate change impacts on ozone levels should account for the widely accepted expectations of ongoing reductions in ozone precursor emissions.</p> <p>Thank you again for the opportunity to comment on this Draft Scientific Assessment. Please contact me with any questions you may have.</p> <p>Sincerely,</p> <p>Matthew D. Hall Senior Environmental Planner Environmental Policy and Strategy Consumers Energy matthew.hall@cmsenergy.com 517-788-2231</p>					

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		cc: Ms. Linda Hilbert, Executive Director, Environmental Services Department, Consumers Energy Mr. Scott Sinkwitts, Esq., Consumers Energy					
Barbara	Warren	<p>June 8, 2015</p> <p>The Interagency Group on Climate Change and Human Health US Global Change Research Program US Environmental Protection Agency 1200 Pennsylvania Ave., NW (6207-A) Washington, DC 20460</p> <p>The Interagency Working Group:</p> <p>We appreciate the opportunity to comment on the Draft Climate and Health Assessment. Federal agencies and others outside of federal government have done extraordinary work on climate change in completing the National Climate Assessment and in response to Presidential Executive Orders. We applaud this important and excellent scientific work. We value the body of work that has been produced and hope you will accept this critique in the spirit in which it is intended.</p> <p>Unfortunately this recent effort related to Human Health is not adequate. Part of the problem may be that the purpose of the document was not entirely clear. The Federal Register announced it as a scientific assessment, but titled it as a Climate and Health Assessment. The CDC and other Health organizations have developed guidelines for conducting a health assessment. The report itself makes an effort to describe what this document is</p>					<p>Thank you for your comment, however policy issues are beyond the defined scope of the Climate and Health Assessment, a scientific document that provides the basis for decision making, but does not address policy. The assessment does not include detailed discussions of climate mitigation, adaptation, or economic valuation. Nor is this a document that provides comprehensive descriptions of research needs. The goal of this assessment is to provide the scientific underpinnings for others to make decisions, develop health policy recommendations, consider adaptive responses, prioritize research needs or programs, or draft what the commenter refers to as a comprehensive health assessment. Those sorts of actions require a firm scientific bases on which to support such recommendations, and that is the purpose of this document.</p>

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		<p>NOT. Unfortunately the Working Group failed to clarify what exactly this report would be—if it was not a policy document and if it did not make recommendations.</p> <p>We are facing a crisis of unprecedented magnitude and scope, with both well-predicted impacts and unanticipated impacts. The unfolding crisis will seriously strain our existing public health system. In order to save lives and prevent disease and disability we need a major effort to develop a Comprehensive Health Assessment, which addresses public health policy and makes recommendations, and is approximately equivalent to the excellent National Climate Assessment.</p> <p>The major concern with this USGCRP Climate and Health Assessment is that it does not really include a Health assessment as defined in the US and actively utilized by state and local health agencies across the US.</p> <p>In fact, it appears as if there was uncertainty regarding the task and the outcome to be achieved. We are told some of what the document was not at p. 24. For example, it is not a policy document. However, it is most definitely not a health assessment.</p> <p>It more closely resembles a literature review, although the document would benefit from a more detailed summary of the peer reviewed literature, the findings and conclusions as well as identification of data gaps.</p> <p>We believe it is a major mistake to not undertake a serious health assessment or at the very least to produce a more limited health policy document related to climate change. First, some health impacts are already being experienced and we need health professionals involved in order to plan for prevention. Prevention is the highest priority for public health professionals and they should play a key role in climate preparedness and community resilience planning in order to save lives and prevent disease and disability.</p>					

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		<p>In contrast to this document, the National Climate Assessment was excellent at gathering information and summarizing the evidence and carefully constructing key points. We need a similar robust effort to develop a Health assessment substantively involving many health professionals in various disciplines, but especially those working in public health.</p> <p>The following key messages are from the Human Health Chapter of the NCA and convey the level of effort that went into the NCA:</p> <ul style="list-style-type: none"> • Key Message 1 states “Climate change threatens human health and well-being in many ways..... and these health impacts are already underway.” • Key Message 2 speaks to existing vulnerabilities and inequities. “Climate change will amplify some of the existing health threats the nation now faces.” • Key Message 3 speaks to the need for public health involvement and to the limits of adaptation. “Public health actions, especially preparedness and prevention, can do much to protect people from some of the impacts of climate change. Early action provides the largest health benefits. As threats increase our ability to adapt to future changes may be limited.” • Key Message 4 addresses health co-benefits. “Responding to climate change provides opportunities to improve human health and well-being.....” <p>A real comprehensive health assessment can enable the development of detailed public health policies related to climate change and prioritize initiatives for funding.</p> <p>Some of the health co-benefits can be obtained on a shorter time frame—providing better health to large numbers of people and saving health dollars simultaneously. Thus transitioning to a clean energy system provides immediate health savings and improved population health. In educating the public immediate or shorter range benefits have significant advantages over longer range predictions about future climate damages.</p>					

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		<p>As a nation we have always been better able to talk about economics as a driving force for action, rather than the importance of social or environmental considerations. Health costs are enormous, and those costs alone can provide the driver for reducing greenhouse gas emissions.</p> <p>New York State identified that Hurricane Sandy cost the state \$32 Billion in damages and predicted that climate damage costs would amount to \$10 Billion on an annual basis. Such costs should enable the appropriate level of investments to prevent worsening climate change.</p> <p>There are many resources concerning Community Health Assessments available from the Centers for Disease Control and Prevention. See http://www.cdc.gov/policy/chna/ Health assessments are data driven utilizing information available on health status, but also related to community resources such as the existing public health system. A serious health assessment needs an adequate framework for assessing public health systematically—utilizing existing data on health, as well as information about existing resources and gaps related to prevention, surveillance and monitoring, public health programs and interventions, education and research.</p> <p>In fact it is not surprising that the existing public health system or infrastructure was not mentioned in this document, nor included in the conceptual diagram provided. Our public health system has been criticized for decades as woefully underfunded and inadequate. In the face of climate change, the situation will become more acute. When we talk about underfunding of national infrastructure we need to talk about far more than roads and bridges.</p> <p>In the context of a Risk Assessment for climate change, this document could be identified as a first step in a risk assessment—Hazard identification. It has identified some of the hazards (not all) associated with Climate change.</p> <p>We recommend tackling the existing document again as a literature</p>					

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		<p>review. By providing more discussion of the findings and research gaps, it will be useful to health researchers and other health professionals. However, we do need a more formal Health Assessment, and if that is not possible at this time a more limited health policy document would be useful as a first step.</p> <p>The National Climate Assessment used facts and data well to convey a comprehensive picture of the impacts of climate change. A Health Assessment should do the same.</p> <p>For example, wildfires result in smoke exposure that has been associated with hundreds of thousands of global deaths annually 260,000 to 600,000 between 1997-2006. (p. 223 NCA) It also cited a 30- fold increase in fine particle air pollution in Baltimore, MD from a wildfire in Quebec in 2002, roughly a thousand miles away. Such information immediately conveys the potential for significant increases in emergency room visits for cardio-respiratory illnesses as well as premature deaths.</p> <p>Fundamental underlying facts aid understanding. For example increasing ambient temperatures leads to more evaporation of volatile organic compounds—which leads to the formation of greater quantities of ozone pollution.</p> <p>The structure and format of the NCA was excellent, and it contained important public health information. This new document needs much more effort.</p> <p>Adaptation needs extensive coverage in a chapter of its own, in order to prepare for multiple climate change threats that can occur simultaneously as well as compounding or cascading health Impacts.</p> <p>Two important concepts were raised at p. 3, but were not really developed further.</p> <p>“While often assessed individually, exposure to multiple climate change threats can occur simultaneously with compounding or cascading health impacts.”</p>					

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		<p>“Climate change can therefore affect human health in two ways: first by changing the severity or frequency of health problems that are already affected by climate and weather factors; and second, by creating unprecedented or unanticipated health problems or health threats in places where they have not previously occurred.”</p> <p>The President has issued an Executive Order focused on Adaptation and this report is supposed to be covering health. We appreciate the mention of adaptive capacity – however the definition refers to communities and institutions as well as people, yet the examples are largely focused on individuals. It is critically important that our government develop the resources to comprehensively deal with adaptation at every level of government and for public and private entities to be jointly engaged in community preparedness and resilience. Our public health infrastructure is in a sorry state, suffering from years of neglect--- and as a result is not capable of playing an absolutely necessary role in community preparedness.</p> <p>For this effort it is essential that we differentiate between access to individual health care and public health needs. Handling a potential Ebola epidemic required significant public health action, beyond patient care.</p> <p>Adaptation or PREPAREDNESS must have a two pronged focus-- not just on preparing to respond to disasters, but preparing for prevention. In other words, what can we do now to prevent certain events or reduce deaths and injuries when an event occurs? Then we need to implement those measures. We also need a fully funded public health infrastructure to reduce deaths, injuries, disease and disability associated with climate change impacts.</p> <p>Integrating public health with other climate science and using health professionals in communicating about climate change.</p> <p>The importance of public health professionals in communicating with the public about climate change has been underappreciated and not well utilized. The public trusts health professionals. Health</p>					

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		<p>professionals must be deliberately engaged in Climate Change collaborations, so other scientists can understand the health perspective and in order for public health to be considered one of the climate sciences. We are facing an enormous climate crisis of a magnitude that will impact every aspect of our lives. We must significantly reduce greenhouse gas emissions within 10 years. Yet, a large number of our political leaders deny the reality of climate change. We know that those with vested interests in fossil fuels have deliberately misinformed the public and created a controversy over the science, where the evidence is overwhelming about the reality of climate change. The Administration's carbon plan is actually a weak and inadequate effort, but even that plan is being fought as if it will cause havoc on the economy.</p> <p>Cascading Failures to Essential Infrastructure was discussed. However, the continued failure to consider existing technological hazards and their interaction with climate change is serious.</p> <p>We cannot be prepared for climate change if we ignore existing hazards in our communities. Advanced technology has connected many of the systems in modern society to each other. This results in the potential for additive and synergistic adverse impacts to a single event. We appreciate the mention of our aging infrastructure and the lack of investment in it. The recent grade of D + should be mentioned here by the American Society of Civil Engineers. In the context of the hazards of an extreme event and related cascading failures, that can be catastrophic, we must begin to include existing technological hazards that are part and parcel of our modern lives in all climate assessments. Extreme weather events do not only involve wind, water, microbes, human sewage and fire. Extreme weather events interact with a host of different kinds of hazardous facilities, hazardous chemical storage, nuclear sites and radiological facilities, degraded 100 yr. old pipelines, etc.</p> <p>The fact that climate change is connected to weather and previously occurring natural events, has obscured our ability to grasp the magnitude of what we must be prepared for. A large measure of denial is also operative, given that we know Hurricane Katrina and flooding, and subsequent events have resulted in the dispersal of toxic chemicals. No scientists however should be</p>					

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		<p>under such delusions. Following March 2011 and the earthquake and tsunami in Japan, the Japanese government was forced to focus on the much more dangerous unfolding nuclear disaster, rather than the desperate human needs of the area population related to the tsunami. While this was not a climate related disaster, it provided a clear illustration of a cascading failure related to our collective societal hubris that underlies our belief in our ability to handle all the technological hazards we have created. We have had multiple recent examples: Freedom Industries in West Virginia released toxic chemicals that shut down the local water supply. In an extreme rainfall event affecting the area around Boulder, Colorado, tanks of toxic chemicals associated with hydraulic fracking were overturned and dispersed. In New Mexico, wildfire threatened the Los Alamos nuclear site and radioactive materials in storage there.</p> <p>In order to prepare for climate change and extreme weather events, we must understand everything about local communities, including the location and nature of existing and hazardous facilities. To date none of the national climate reports touch on such hazards. We are only aware of one produced by the non-profit organization, Center for Health, Environment and Justice, related to Climate change and Superfund sites. In Western NY we have a former nuclear reprocessing facility located on a site that is actively eroding. Long lived radioactive materials buried there may not be possible to contain, given increasing extreme rainfall events, thus jeopardizing Lake Erie and the drinking water for millions.</p> <p>Preparing communities to deal proactively with such hazards may be cost effective and avoid diverting essential emergency response from human needs during a disaster.</p> <p>The Conceptual Diagram presented for Climate Change & Health is useful, but needs improvement. (p. 4)</p> <p>This is a useful conceptual diagram, but it must be improved. Public health infrastructure matters a lot in determining the health outcomes of climate change. It must be given more importance. Public health infrastructure does not mean a building, but all the kinds of people and resources necessary to accomplish all the core public health functions.</p>					

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		<p>We wonder whether there should be separate diagrams to talk separately about more chronic, long term effects of climate change versus extreme weather events that cause acute impacts.</p> <p>Points on the diagram:</p> <ul style="list-style-type: none"> • Deaths and injuries and disabilities need to be included as health outcomes. • The title “Non-Climate Stressors” is an inadequate descriptor. <p>Existing Community Hazards must include industrial facilities and other sources of hazardous chemicals, fuels and radiologicals. Thus far federal climate change documents almost totally ignore the reality of multiple technological hazards that will interact with climate change events.</p> <p>This needs immediate correction or communities will not be prepared.</p> <ul style="list-style-type: none"> • The existing underfunded public health infrastructure should be included in the blue pathway prior to health outcomes. We need to acknowledge the difference between public health programs and access to individual care. Public health must have a sizeable role in all adaptation efforts at the national, state and local community levels—or we will not be prepared. • In the blue pathway, existing major health problems and inequities should be included after exposure pathways followed by the underfunded public health infrastructure. <p>Social and economic inequities are systemic and impact health status and vulnerabilities of many communities in the US. We appreciate the attention given to Populations of Concern in this document, however there is much more work to be done to prepare for Climate Change. We urge a much more comprehensive effort to produce a real Health Assessment that accounts for our health system and its inadequacies, the existing burden of disease as well</p>					

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		<p>as the long standing inequities that will be exacerbated as a result of climate change.</p> <p>Please address questions to B. Warren at 845-754-7951.</p> <p>Respectfully submitted,</p> <p>Barbara J. Warren, RN, MS Executive Director Citizens' Environmental Coalition warrenba@msn.com</p> <p>Laura Anderko, PhD RN Professor, Robert and Kathleen Scanlon Endowed Chair in Values Based Health Care Fellow, Center for Social Justice Director, Mid-Atlantic Center for Children's Health and the Environment Georgetown University</p> <p>Larysa Dyrszka, MD</p>					

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		<p>Pediatrician</p> <p>Co-Founder- Concerned Health Professionals of NY</p> <p>Sheila Bushkin-Bedient, MD, MPH</p> <p>Preventive Medicine and Family Health</p> <p>Co-founder - Concerned Health Professionals of New York</p> <p>Member, Institute for Health and the Environment, SUNY Albany</p> <p>Former Vice Chair, Preventive Medicine and Family Health, MSSNY</p> <p>Yolanda Whyte, MD</p> <p>Pediatrician</p> <p>Atlanta, GA</p> <p>Judy Braiman</p> <p>Empire State Consumer Project</p> <p>New York</p> <p>Kathleen Nolan, MD, MSL</p> <p>Senior Research Director</p>					

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		<p>Catskill Mountainkeeper</p> <p>Pediatrician</p> <p>Co-Founder- Concerned Health Professionals of New York</p> <p>David R. Brown ScD.</p> <p>Public Health Toxicologist</p> <p>Southwest Pennsylvania Environmental Health Project</p> <p>Collin Thomas</p> <p>Siobhan Burke</p> <p>Founding Members</p> <p>Capital District Against Fracking</p> <p>Albany, NY</p> <p>Jessica Azulay</p> <p>Program Director</p> <p>Alliance for a Green Economy</p> <p>New York</p>					

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		Mary V. O'Reilly, PhD, CIH, CPE Adjunct Professor SUNY School of Public Health, University at Albany Environmental Health and Toxicology					
Paul	Knappenberger	And pigs could fly. But they don't. And neither does "as calculated by extrapolating statistical relationships and without considering potential adaptive changes" This is wrong. Remove all reference to counter-factual studies (i.e., those assuming no adaptation) as there is strong and pervasive evidence in the scientific literature that human populations the world over (including in the U.S.) adapt to (changes in) extreme temperatures. For a recent example, see Knappenberger et al., (2014). Presenting projections that are based on "extrapolating statistical relationships and without considering potential adaptive changes" is not science, but rather, science fiction. Reference: Knappenberger, P., Michaels, P., and A. Watts, 2014. Adaptation to extreme heat in Stockholm County, Sweden. Nature Climate Change, 4, 302-303.	Ch 2: Temperature-Related Impacts		51	2	A more explicit mention of adaptation was made in Key Finding 1. As the cited study is for non-US location, and as there are already multiple citations for studies on adaptation within the US, the authors have decided that citing this paper is not necessary.
Paul	Knappenberger	"Days that are hotter than normal in the summer or colder than normal in the winter are both associated with increased illness and death... mortality effects are also seen for smaller deviations of even a few degrees from seasonal averages."	Ch 2: Temperature-Related Impacts		51	9	After consideration of this point, the authors determined that the existing text is clear and accurate. Additional studies have been cited addressing mortality impacts of small deviations of temperature from seasonal averages.

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		<p>No. See Davis et al., 2003a, 2003b. The variability in daily mortality is such that whatever temperature signal there may be is overwhelmed by the noise on all but a few days of the year with exceptional deviations from the seasonal average (i.e., there exists threshold temperatures).</p> <p>References:</p> <p>Davis, R.E., P.C. Knappenbergre, P.J. Michaels, and W.M. Novicoff, 2003a, Decadal changes in summer mortality in U.S. cities. International Journal of Biometeorology, 47, 166–75.</p> <p>Davis, R.E., P.C. Knappenbergre, P.J. Michaels, and W.M. Novicoff, 2003b, Changing heat-related mortality in the United States. Environmental Health Perspectives, 111, 1712–1718.</p>					
Paul	Knappenberger	You got this all right except for the last sentence (see next comment). This should be Key Finding #3. Replace existing Key Finding #1 with this one (including our edit in next comment), as your preference ought to be for science over science fiction.	Ch 2: Temperature-Related Impacts		51	16	<p>After consideration of this point, the authors determined that the existing text is clear and accurate.</p> <p>No change has been made to the text.</p>
Paul	Knappenberger	<p>“Including this adaptation trend in human health projections will reduce but not eliminate the increase in future deaths from heat [Likely, Low Confidence].”</p> <p>This is wrong.</p>	Ch 2: Temperature-Related Impacts		51	20	Some changes have been made to the text in response to this suggestion.

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		<p>In major U.S. cities, during the period from the 1960s through the late 1990s, summer afternoon temperatures increased while mortality rates declined (see Davis et al., 2003 a,b). So why suppose that this behavior won't continue to do so in the future? This has general trend has been identified not only in the U.S., but in diverse locations around the world. As we wrote in Knappenberger et al., (2014):</p> <p>"Some portion of this response [to extreme heat events] probably reflects the temporal increase in the frequency of extreme-heat events, an increase that elevates public consciousness and spurs adaptive response. In this manner, climate change itself leads to adaptation.</p> <p>"It is insufficient to ignore this effect when compiling and discussing the impacts of climate change. If an increasing frequency of heat events raises public awareness and gives rise to an adaptive response that lowers the population's relative risk due to extreme heat, this must be properly weighed against any increases in mortality that result from a greater number of mortality-inducing heat events. In the case of Stockholm County, raised awareness from climate change need only be responsible for 288 out of 2,304 (~13%) deaths saved through adaptation to have completely offset the climate-related increase in heat-related mortality identified by Oudin Åström et al. For any greater contribution, climate change would have resulted in an overall decline in heat-related mortality in Stockholm County despite an increase in the frequency of extreme-heat events. Such a result would be consistent with findings for other major cities in Europe and the US2-5 and would stand in opposition to the conclusions drawn by Oudin Åström et al.</p>					

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		<p>"Our analysis highlights one of the many often overlooked intricacies of the human response to climate change."</p> <p>More properly, instead of "Including this adaptation trend in human health projections will reduce but not eliminate the increase in future deaths from heat [Likely, Low Confidence]" you should write "Including this adaptation trend in human health projections will reduce and potentially eliminate the increase in future deaths from heat, as well as drive down heat-related mortality in total [Likely, High Confidence]."</p> <p>References:</p> <p>Davis, R.E., P.C. Knappenbergre, P.J. Michaels, and W.M. Novicoff, 2003a, Decadal changes in summer mortality in U.S. cities. <i>International Journal of Biometeorology</i>, 47, 166–75.</p> <p>Davis, R.E., P.C. Knappenbergre, P.J. Michaels, and W.M. Novicoff, 2003b, Changing heat-related mortality in the United States. <i>Environmental Health Perspectives</i>, 111, 1712–1718.</p> <p>Knappenberger, P., Michaels, P., and A. Watts, 2014. Adaptation to extreme heat in Stockholm County, Sweden. <i>Nature Climate Change</i>, 4, 302-303.</p>					
Paul	Knappenberger	"Elderly persons...have a higher risk of dying due to increasing frequency, intensity, and duration of future heat and heat waves."	Ch 2: Temperature-		51	22	Clarified and added new reference regarding heat-related vulnerability for older adults.

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		<p>What you state is true for climate in general, but it is unclear that it is true for climate change. You cite Bobb et al. (2014) elsewhere, but neglect to mention that Bobb et al. (2014) found the sensitivity of elderly population to extreme heat has become indistinguishable from the sensitivity of the below 65 year age group. Quoting from Bobb et al (2014):</p> <p>"We found that mortality risks in the eldest (≥ 75) age group differed from the youngest (< 65) at baseline but were statistically indistinguishable by the end of the study period. This suggests that while the elderly have historically been more susceptible to extreme heat (Basu 2009), interventions that are more broadly targeted to reduce vulnerability to heat over the lifespan should be considered moving forward."</p> <p>Reference:</p> <p>Bobb, J.F., R.D. Peng, M.L. Bell, and F. Dominici, 2014. Heat-related mortality and adaptation in the United States, Environmental Health Perspectives, http://dx.doi.org/10.1289/ehp.1307392</p>	Related Impacts				
Paul	Knappe nberger	<p>"This effect is referred to as mortality displacement. While this effect can be important for relatively modest heat events, it is not seen in more extreme events (such as the Chicago heat wave discussed in Box 1, where there is no corresponding reduction below the average number of deaths following the elevated rate of deaths during the event)."</p>	Ch 2: Temperature-Related Impacts		56	36	The text has been revised based on this comment.

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		<p>Huh? Better check your Kaiser et al. (2007) reference again (http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1854989/)</p> <p>From Kaiser et al (2007): “We estimated that there were 692 excess deaths from June 21, 1995, to August 10, 1995; 26% of these deaths were owing to mortality displacement.”</p>					
Paul	Knappenberger	<p>“Projecting these trends into the future is challenging, but future changes in adaptive capacity are likely to modestly reduce the future increase in mortality”</p> <p>Isn't the point of this whole USGCRP Climate and Health Assessment to address the challenges of climate change??</p> <p>So why do you all refuse to do so in this Chapter (as evidenced by the Box contents)? Instead of science fiction (assuming no adaptation), you ought to seriously look at the probable (potential) impacts from adaptation. As is widely recognized, heat-related mortality is preventable, your future assessment of heat-related mortality increases should include a value of zero. Yet that number never appears in the report, which seems to prefer “A warmer future is projected to lead to increases in future mortality on the order of thousands to tens of thousands of additional deaths per year across the United States by the end of this century” (p59, line 10-11). In fact, it is quite possible that future climate changes will lead to the adoption of additional adaptive measures with an overall result which may result in a decrease in the rate of heat-related mortality (Knappenberger et al., 2014). Such a result is as readily anticipated as the increases that you all report and yet is never approached in this Assessment--a major error.</p>	Ch 2: Temperature-Related Impacts		60	15	Some changes have been made to the text. However, there is still little clarity in the literature regarding incorporation of adaptation into mortality projections.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		References Knappenberger, P., Michaels, P., and A. Watts, 2014. Adaptation to extreme heat in Stockholm County, Sweden. Nature Climate Change, 4, 302-303.					
Paul	Knappenberger	<p>“On the other hand, if current trends of population growth and migration into large urban areas continue, there may be an increasing urban heat island effect which will magnify the rate of warming locally.”</p> <p>This has nothing to do with greenhouse gas-induced climate change.</p> <p>Nor does this “the changing proportions of vulnerable populations, including the elderly, in the future.”</p> <p>Remove these statements. If you think they are relevant, it indicates that you do not understand the nature of the issue that you are discussing. Changes in heat-related mortality that are the result of changing population demographics don’t belong in a discussion of climate (change) related impacts.</p>	Ch 2: Temperature-Related Impacts		60	21	After consideration of this point, the author team determined that the existing text is relevant. No change has been made to the text.
Samantha	Ahdoot	<p>Thank you for this comprehensive review of the impacts of climate change on human health.</p> <p>It is an invaluable resource to physicians and policy makers.</p> <p>As a pediatrician, I particularly appreciate your inclusion of detailed information on the impacts on children. My patients are at</p>					We greatly appreciate your positive comment about our report and hope that you find the content useful.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		highest risk from climate change associated health effects, and this document delineates these impacts and risks.					
Paul	Knappe nberger	<p>We are often selected by journal editors to be reviewers of papers concerned with heat-related mortality as we have a strong publication record in this field. Without exception, we recommend rejection of each and every paper we review that uses the methodology as laid out in this Box.</p> <p>We realize that we are beating our head against the wall to try to get you all to understand all this, because you have a predisposition not to. The USGCRP seems bound and determined to push for a large rise in future mortality from extreme heat, when the scientific research employing robust methodologies simply does not support it.</p> <p>It is interesting to compare the heat results from Figure 3 in the Box (page 84) described as “projected increase in death rates due to warming in the summer months,” with those from Davis et al., 2003b.</p> <p>[Don't know how to include Figures in this Comment Submission form. Top is Figure 3 from the BOX, and bottom is Figure 2 from Davis et al., 2003b]</p> <p>CAPTION: TOP: Results from USGCRP Chapter 2, Figure 3, projecting future changes in the rate of heat-related mortality in U.S. cities. BOTTOM. Results showing observed changes in rate of heat-related mortality in U.S. cities as described by Davis et al., 2003b.</p>	Ch 2: Temperat ure- Related Impacts		60	33	After consideration of this point, the authors determined that the existing text is clear and accurate. The authors recognize that there are differing opinions regarding the best methodologies, but the majority of researchers in the field find these approaches to be appropriate. No change has been made to the text.

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>The results from Davis et al., (2003b) show a heat-related morality decline over time, despite rising afternoon apparent temperatures. With this trend in mind, does it make sense to make “no explicit assumptions or adjustment for potential future adaptation”? We’ll answer that question for you. No.</p> <p>Also, p84 line13-14 in the caption of Figure 3: “Therefore, these results reflect only the effect of the anticipated change in climate over time.”</p> <p>This is wrong as well. For example, see Knappenberger et al., 2014, where we suggest that climate changes actually beget an adaptive response (why wouldn’t they?).</p> <p>"[M]uch of the adaptation has likely occurred because of an increased frequency of heat waves. As heat waves become more common, the better adapted to them the population becomes.</p> <p>"Our analysis highlights one of the often overlooked intricacies of the human response to climate change—the fact that the response to climate change can actually improve public health and welfare."</p> <p>References:</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>Davis, R.E., P.C. Knappenberge, P.J. Michaels, and W.M. Novicoff, 2003b, Changing heat-related mortality in the United States. Environmental Health Perspectives, 111, 1712–1718.</p> <p>Knappenberger, P., Michaels, P., and A. Watts, 2014. Adaptation to extreme heat in Stockholm County, Sweden. Nature Climate Change, 4, 302-303.</p>					
Paul	Knappenberger	<p>Entire Section 2.9 “Populations of Concern”</p> <p>Comment: This has nothing to do with climate change and health. Remove this section entirely.</p>	Ch 2: Temperature-Related Impacts		62	7	After consideration of this point, the author team determined that the existing text is relevant. No change has been made to the text.
Paul	Knappenberger	<p>“There have been suggestive links between rapid recent Arctic sea ice loss (Liu et al. 2013) and an increased frequency of cold (Liu et al. 2012) and warm extremes (Francis and Vavrus 2012), but this is an active area of research with conflicting results (Wallace et al. 2014; Barnes 2013).”</p> <p>Remove this section. This is not the place to address this highly complex issue and invites speculation that is not based in robust science.</p>	Ch 2: Temperature-Related Impacts		64	31	<p>After consideration of this point, the authors determined that the existing text is clear and accurate. Discussion of emerging issues in projections of changing temperature variability are appropriate for the “emerging issues” section of a chapter on temperature and health.</p> <p>No change has been made to the text.</p>
Paul	Knappenberger	<p>“In regions where temperature variability increases, mortality will be expected to increase, and vice versa (Gosling et al. 2008a).”</p> <p>No. See Davis et al., 2004, which finds:</p> <p>"Temperature currently does not have a major influence on monthly mortality rates in US cities. By the 1990s, there was little</p>	Ch 2: Temperature-Related Impacts		64	34	<p>After consideration of this point, the authors determined that the existing text is clear and accurate. There is substantial evidence that temperature can have mortality effects, as assessed in this chapter.</p> <p>No change has been made to the text.</p>

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		<p>evidence of a net mortality benefit to be derived from one's place of residence."</p> <p>Reference:</p> <p>Davis, R.E., P.C. Knappenberger, P.J. Michaels, and W.M. Novicoff, 2004. Seasonality of climate-human mortality relationships in US cities and impacts of climate change. <i>Climate Research</i>, 26, 61-76.</p>					
Paul	Knappenberger	<p>Fatal Flaw in Underlying Assumption</p> <p>The first sentence of the Climate and Health Assessment exposes the report's fatal flaw "Climate change is a significant threat to the health of the American people." This statement is based upon the untested assumption that the climate of the mid-to-late 20th century in the United States is the optimal one for the health of Americans. Yet nowhere, to our knowledge, can the basis for such an assumption be found in the scientific literature. Without establishing the ideal climate, it is pure speculation to make a statement like the one noted above. The USGCRP Climate and Health Assessment is not a comprehensive review of how climate impacts all aspects of the well-being of Americans, but rather a narrow and selective look at how projected changes in climate (projections that are largely grounded in climate model projections which have known faults and limitations) may impact some narrow and selective facets of human health. Sure, there are negatives associated with any change, but that is not the overarching question. The relevant question, and the one not answered by the USGCRP, is what is the net outcome on climate change on the population of Americans.</p>	Executive Summary				<p>The physical scientific basis behind climate change and the anthropogenic influence on recent climate change is discussed in the 2014 National Climate Assessment (NCA3). Trends in population and health, as well as the influence of non-climate change related factors, are discussed in the introduction chapter. The assessment does not include detailed discussions of climate mitigation, adaptation, or economic valuation. Consideration of greenhouse gas emissions pathways and human adaptive capacity (see Front Matter and Introduction chapter) has been included as appropriate to assess projected climate impacts on human health. The entire report has been reviewed to ensure proper terminology in terms of weather, climate, climate change, and climate variability have been used. The comment regarding life expectancy is inconsistent with the author team's thorough assessment of the science. The chart the commenter cites provides no insight into the risk or trend of any specific factor (climatic or non-climatic) on life expectancy. The measures of health improvements, such as life expectancy, are of limited meaning in the</p>

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		<p>Admittedly, answering such a question is exceedingly difficult, if not impossible. There are so many confounding factors in play. Obvious examples include changing population demographics (including age-structure), changing medical technologies, changing health care, changing diets, and changing habits. On the climate side of things, additional complicating factors are to be found including improving weather forecasts, improving warning systems, improving observational systems, and improving preparation. But it is quite likely that it is the non-obvious influences which are most at play.</p> <p>Compounding the situation is that the impacts of a changing climate are not constant over various timescales. Climate change provokes the development and adoption of adaptive measures—measures which insulate us against future impacts and lowers the future threat. Depending on the types of adaptive measures deployed, these may become effective on timescales from weeks to decades (or even longer). For example, an unusual summer heatwave may increase daily mortality in unprepared localities for a few days, but adaptive measures ranging from simple actions (community awareness programs and cooling centers) with deployment in times in weeks to months, to more elaborate (heat watch/warning systems, building design), with deployment horizons from years to decades.</p> <p>And one must be careful not to fall prey to confusing climate change with climate (including climate variability). Too often reports like these are written with blinders on that mislead the authors into thinking that all impacts are a result of climate changes, when, in fact, climate change plays but a tiny role in the overall climate—with the role of human-caused climate change extremely difficult to identify, much less even be anticipated in a robust manner.</p>					<p>context of the evaluation of risks due to a changing climate, which can occur via various pathways. The single metric of life expectancy does not convey or provide information on the risks associated with changes in climate and whether or not they are increasing, either in the past or in the future. While the commenter notes that this increase in life expectancy has occurred despite increasing temperatures and CO2 levels, it does not represent future conditions in which climate is likely to become warmer and with likely more variable precipitation.</p>

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		<p>Perhaps the largest hurdle the USGCRP has to overcome to establish a growing threat from climate change is that the simplest measure of human well-being, life expectancy, shows a large increase since the beginning of the 20th century (Figure 6).</p> <p>[Don't know how to submit Figures in the Comment form, but you all know what this looks like]</p> <p>CAPTION: Life expectancy at birth, United States, 1900-2013 (Data source: http://www.cdc.gov/nchs/data/nvsr/nvsr64/nvsr64_02.pdf).</p> <p>Life expectancy is indicative of the sum total of all influences on the well-being of Americans and shows that the overall climate has been increasing favorable. This has occurred at the same time as a rise in global and national temperatures (from whatever the cause).</p> <p>But, climate (including variability and change) is eminently more complex than a simple annual average of a large area temperature can indicate (a parameter that no individual experiences). As we try to decrease the temporal and spatial scales to those relevant for human health, the complexities of the climate overwhelms our abilities to project them more than a few days into the future.</p> <p>Oversimplifications therefore become commonplace, such as using coarse resolution climate model output involving a limited number of variables to downscale to local time and places. This procedure</p>					

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		<p>is one is widely recognized as being fraught with uncertainty, and thus produces non-robust and unreliable results.</p> <p>All of which compounds to produce a nearly intractable situation in which determining the role on anthropogenic climate change in the overall health and well-being of Americans, now and in the future, becomes fraught with nearly unavoidable pitfalls, many of which the USGCRP has stepped directly in. In doing so, the USGCRP has produced a document that serves not to inform the public as to the existing state of robust science on the topic of climate and human health, but rather to misinform them and local, state and national policy as well.</p>					
Paul	Knappe nberger	<p>All comments submitted by Chip Knappenberger represent the combined comments of Patrick J. Michaels and Paul C. Knappenberger of the Center for the Study of Science at the Cato Institute.</p> <p>Summary of Comments</p> <p>What is clear from this report, The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment, and all other similar ones that have come before, is that the USGCRP simply chooses not to accept the science on human health and climate and instead prefers to forward alarming narratives, many based on science fiction rather than actual science. To best serve the public, this report should be withdrawn. By going forward without a major overhaul, its primary service would be to misinform and mislead the general public and policymakers alike.</p>					<p>This report was developed by USGCRP’s Interagency Group on Climate Change and Human Health as part of the sustained National Climate Assessment and as called for under the President’s Climate Action Plan. The National Climate Assessment has been mandated by Congress since 1990. The transparent process leading to this report is documented on our website and has included numerous avenues for the public to engage. All sources were assessed to meet the guidance to authors on Information Quality. This guidance assures that sources comply with Information Quality Act requirements for (1) utility, (2) transparency and traceability, (3) objectivity, and (4) integrity and security. In addition, the entire report has been peer reviewed by the National Academies of Sciences’ National Research Council.</p>
Noelle	Selin	<p>A recently accepted manuscript (Garcia-Menendez et al., 2015, "U.S. air quality and health benefits from avoided climate change under greenhouse gas mitigation," Environmental Science and Technology) used atmospheric modeling to show that monetized air pollution-related health benefits from greenhouse gas policy are</p>	Ch 3: Air Quality				<p>A citation has been added to this paper.</p>

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		significant, and that the climate-induced air quality benefits of policy increase with time and are largest between 2050-2100. I suggest that the chapter incorporate citation to this recent evaluation of health-related climate damages and relevant policy benefits.					
Paul	Knappe nberger	<p>The authors of the USGCRP draft of the The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment report have an outstanding imagination for coming up with ways that climate change may negatively impact the health and well-being of Americans, but a profound lack of understanding in the manner in which health and well-being is impacted by climate (including climate change).</p> <p>In modern American society, we have largely insulated our health and welfare from the climate. The United States has a population of nearly than 320 million people living across a diverse range of climates—a range that is an order of magnitude (or more) larger the projected impacts of human-cause climate change—and yet the health and well-being differences of the population across these diverse climates is extremely minimal. Those differences with a direct component of climate associated with them are even smaller. For example, in examining trends and patterns of temperature-related mortality in America, Davis et al. (2004) concluded “The overarching implication of this result indicates that there is no net mortality benefit to one’s place of residence derived from the location’s climate.”</p> <p>Rather than speculate on how human-caused climate change from greenhouse gas emissions may impact our health and well-being in the future—speculation which is open to influence of preconceived notions, policy preferences, and other matters of personal belief, any or all of which may differ from individual to individual—a more grounded approach is to look across existing climate space and examine the character of the response. In doing so, it is readily obvious that Americans, across all climates, are well-adapted to the</p>					<p>The difference between climate and weather, and the influence of non-climate-change related factors, is discussed in The Introduction chapter. The entire report has been reviewed to ensure proper use of terms including weather, climate, climate change, and climate variability. The assessment does not include detailed discussions of climate mitigation, adaptation, or economic valuation. Consideration of greenhouse gas emissions pathways and human adaptive capacity (see also Front Matter and Introduction Chapter), such as adaptation to heat as the commenter notes, has been included as appropriate to assess projected climate impacts on human health. Please see the Introduction Chapter and the chapter on Temperature-Related Illness and Death for discussion of adaptive responses to heat and non-climate-change related factors (e.g. migration) included in the underlying peer reviewed literature assessed for these chapters.</p>

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		<p>prevailing climate (and its inherent weather events, both mild and extreme).</p> <p>However, this adaptation remains imperfect, as evidenced by the number of Americans still negatively impacted by components of the climate that they live in. Less than perfect, yes, but static, no.</p> <p>For example, research such as the Davis et al., (2003a, 2003b) shows that while heat waves still lead to elevated daily mortality totals in some cities across the United States (mostly Midwestern and Northeastern cities where heat waves are still relatively uncommon), the sensitivity of urban populations to extreme heat events has been on the decline since at least the mid-1960s (Figure 1). More recent research (e.g., Bobb et al., 2014) shows that these declines have continued. Not only has our adaptive response greatly lowered our sensitivity to extreme elements of climate, but we continue to make improvements going forward.</p> <p>[Don't know how to submit Figures in this Comment form. This Figure is Figure 2 from Davis et al., 2003b in references]</p> <p>Figure 1. Annual heat-related mortality rates (excess deaths per standard million population on days in which the decadal-varying threshold apparent temperature (AT) is equaled or exceeded) by city and decade, and long-term trend in summer afternoon AT. Each histogram bar indicates a different decade: from left to right, 1960s–1970s, 1980–1989, and 1990–1998. Decades without histogram bars exhibit no threshold ATs and no heat-related mortality. Decades with gray bars have mortality rates that are statistically significantly different from the decades indicated by black bars. The average excess deaths across all 28 cities is shown</p>					

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		<p>at the lower left. AT trends are indicated beneath each city abbreviation (from Davis et al., 2003).</p> <p>There is no tenable reason to think that further improvements will not continue to be achieved and a greater level of adaptation to extreme heat events attained—along with ever less impact on human health and well-being.</p> <p>Looking beyond extreme temperature impacts on mortality, Goklany (2009), in a major study, found that for the entire collection of extreme weather impacts, mortality has greatly declined over the course of the past several decades, not only in the U.S., but for the globe in general. These findings are extremely relevant to the proper understanding of climate and health in the U.S. Goklany (2009) summarizes:</p> <p>"Current deaths and death rates from extreme weather events for both the U.S. and the globe are, in general, lower than in previous decades. Predictably, annual death rates have declined more rapidly than annual deaths, confirming results from previous studies. This indicates that the total risk of death from such events has actually declined, notwithstanding any increases in the number or intensity of extreme weather events that some claim to have occurred. Globally, as well as for the United States, the aggregate contribution of extreme weather events to the mortality burden is currently minor—on the order of 0.06%.</p> <p>"In the U.S, more lives are lost in an average year to extreme temperatures—both heat and cold—than to more heavily publicized events such as tornados, hurricanes, and floods. According to CDC data, extreme cold, on average, claims more</p>					

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		<p>lives than extreme heat, tornados, floods, lightning, and hurricanes combined. In general, mortality and mortality rates from the various categories of extreme events examined here are lower today than in the past. Mortality during the 2000s was lower than in earlier peak periods by 59%–81% for floods, lightning, tornados, and hurricanes, while mortality rates were 72%–94% lower. However, there are no consistent trends for mortality due to floods.</p> <p>"These improvements have occurred despite increases in the populations at risk, in large part because of greater access to the capital and technology necessary to protect against and to cope with adversity in general and extreme weather events in particular. Even if the number of events has increased—and the long-term record is inadequate for ascertaining whether it has—wealth, technology, and human and social capital for the most part have, despite notable exceptions, apparently been of greater importance than any global warming or changes in climatic variability in determining mortality.</p> <p>"Finally, despite population increases, over the long term cumulative mortality from extreme weather events has declined both globally and for the United States, even as total (all-cause) mortality has increased. This indicates that humanity is coping better with extreme weather events than with far more important health and safety problems."</p> <p>Through our increasing ability to shelter ourselves from the climate, we have greatly reduced the overall impact that the elements of climate have on our overall health/mortality.</p>					

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		<p>Another feature of modern American society is that it is extremely mobile—which means, we can choose the climate in which we live (a form of adaptation as well as an expression of preference). As planes, trains, and automobiles replaced the horse and buggy, Americans became more mobile, and where we live was no longer connected primarily with proximity to where we were born. Instead, we have become much freer to choose our place of residence based on considerations other than ease of getting there.</p> <p>Where has our new-found freedom of mobility led us? Figure 2 shows the rate of population change from 1900-2010 in each of contiguous 48 states.</p> <p>[Don't know how to submit Figures in the Submission form. This Figure is Figure 1 from http://www.cato.org/blog/some-it-hot]</p> <p>Figure 2. The state-by-state population trend (people/year) from 1900 to 2010.</p> <p>Comparing a map of the change in population (Figure 2) with a map depicting the average temperature of each state (Figure 3) reveals a pretty strong indication that people seem to be seeking out the warmer states (and the other aspects of climate than come along with higher temperatures).</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>[Don't know how to submit Figures in the Submission form. This Figure is Figure 2 from http://www.cato.org/blog/some-it-hot]</p> <p>Figure 3. The state-by-state average annual temperature for the period 1900-2010.</p> <p>A way of looking at human temperature preferences is to calculate what the “average experiential temperature”—that is, the annual temperature that the average person living in the lower 48 states experiences each year. We can calculate this value by first multiplying the average temperature in each state during a particular year by the state’s population in the same year. Then we sum this product across the 48 contiguous states, and finally divide this sum by the total population of the country. In other words, the temperature in states with larger populations weigh more heavily on the national composite experiential temperature than does the temperature in those states with sparser populations. As the population of the country redistributes itself over time, we can track how the average person’s climate changes.</p> <p>When we do that for each year from 1900 to 2013, we get the result shown in Figure 4—a steadily rising temperature. In fact, the average experiential temperature has risen by a total of about 3.85°F over the course of the last 114 years (a rate of 0.34°F per decade).</p> <p>[Don't know how to submit Figures in the Submission form. This Figure is Figure 3 from http://www.cato.org/blog/some-it-hot]</p>					

First Name	Last Name	Comment	Chapter	Figure/ Table Number	Start Page	Start Line	Response
		<p>Figure 4. The average experiential temperature of the population of the United States, 1900 to 2013.</p> <p>But the history of experiential temperatures alone can't tell us whether the increase has been unwillingly forced upon us by a large-scale warming of the climate from, say, an enhanced greenhouse effect, or whether the change results from Americans seeking out warmer locales on their own accord.</p> <p>To answer this question, we must calculate the area-weighted average temperature of the United States—that is, the combination of the yearly average temperature within each state weighted by that state's total area. In this case, it is the size of the state, rather than the size of its population, that matters—the bigger the state, the bigger its contribution to the nationwide average.</p> <p>The result of this calculation is a quite different looking temperature history. In Figure 5, we included the annual U.S. average temperature history along with the annual U.S. “experiential” temperature.” We see that, while the United States has fluctuated a bit, experiencing warm decades such as the 1930s and 1990s and cold ones such as the 1910s and 1970s, the annual average temperature has increased only slightly during the 20th century—about 0.90°F (a rate of 0.08°F/decade).</p> <p>[Don't know how to submit Figures in the Submission form. This Figure is Figure 4 from http://www.cato.org/blog/some-it-hot]</p>					

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		<p>Figure 5. Average temperature and average “experiential” temperature of the United States, 1900 to 2013.</p> <p>Although there has been a warm-up of the actual temperature, that rise is much less than the increase in the experiential temperature. In fact, the average experiential temperature has climbed at a rate more than four times that of the U. S. average temperature—which is the experiential temperature had the population distribution not changed at all. That means that Americans have actively been moving to warmer climates. And there is every indication that they are continuing to do so, as evidenced by the strong rise in experiential temperatures during the past 20 or 30 years.</p> <p>While climatologists have not generally appreciated this fact, it has been long recognized and appreciated by sociologists. As both people's mobility and their ability to select the climate they prefer have increased throughout this past century, the core of the U.S. population has moved southward—into warmer climates. The overall migration of people into the southern states has created a temperature change over time for the average American that far outstrips any contribution from human-caused climate change for the past century, and rivals the projections for the next.</p> <p>What all of the above tells us can be summed up like this: climate—and for the matter more relevant to the USGCRP Climate and Health Assessment, climate change—begets the human adaptive response.</p> <p>This is being increasingly being recognized in the scientific literature. For example, Knappenberger et al. (2014), in discussing</p>					

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		<p>the response to an increasing frequency of extreme heat events, notes:</p> <p>"Some portion of this response probably reflects the temporal increase in the frequency of extreme-heat events, an increase that elevates public consciousness and spurs adaptive response. In this manner, climate change itself leads to adaptation. It is insufficient to ignore this effect when compiling and discussing the impacts of climate change. If an increasing frequency of heat events raises public awareness and gives rise to an adaptive response that lowers the population's relative risk due to extreme heat, this must be properly weighed against any increases in mortality that result from a greater number of mortality-inducing heat events...Our analysis highlights one of the many often overlooked intricacies of the human response to climate change."</p> <p>And, unfortunately, the USGCRP and the author team of the Climate and Health Assessment are among those who have completely overlooked this intricacy.</p> <p>But this does not come as surprising.</p> <p>We have been through this exercise repeatedly, having submitted voluminous comments on previous USGCRP reports dealing with health, including the first, second, and third National Climate Assessments. While we've seen some changes in response to a few of our specific comments, there is never any response to our most general comment, that the overall tone of the USGCRP on the topic is overly pessimistic in light of demonstrable gains in human well-being, even coming in the face of a change climate.</p>					

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		<p>This Climate and Health Assessment is but another in this same mold.</p> <p>Rather than a point-by-point set of comments going over the entire draft Climate and Health Assessment (and effort which we have, in the past, dedicated untold man hours, even going as far as to develop an entire volume dedicated to what the USGCRP second National Assessment Report should have looked like if one were to take a dispassionate look at climate change impacts in the US, http://object.cato.org/pubs/Global-Climate-Change-Impacts.pdf), in this Comment we take an approach of highlighting the fatal flaw in the main underlying assumption of the USGCRP assessment report. Without the proper attention to this flaw, the entire report should be withdrawn.</p> <p>But to demonstrate that we do not take this route because we found the specifics within the report to be an acceptable representation of the underlying science, we provide targeted comments on Chapter 2, “Temperature-related Death and Illness.” We find much wrong with this Chapter, as we do with all the Chapters. The selective and (mis)use of the science is pervasive.</p> <p>References</p> <p>Bobb, J.F., R.D. Peng, M.L. Bell, and F. Dominici, 2014. Heat-related mortality and adaptation in the United States, <i>Environmental Health Perspectives</i>, http://dx.doi.org/10.1289/ehp.1307392</p>					

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		<p>Davis, R.E., P.C. Knappenbergre, P.J. Michaels, and W.M. Novicoff, 2003a, Decadal changes in summer mortality in U.S. cities. <i>International Journal of Biometeorology</i>, 47, 166–75.</p> <p>Davis, R.E., P.C. Knappenbergre, P.J. Michaels, and W.M. Novicoff, 2003b, Changing heat-related mortality in the United States. <i>Environmental Health Perspectives</i>, 111, 1712–1718.</p> <p>Davis, R.E., P.C. Knappenberger, P.J. Michaels, and W.M. Novicoff, 2004. Seasonality of climate-human mortality relationships in US cities and impacts of climate change. <i>Climate Research</i>, 26, 61-76.</p> <p>Goklany, I.M., 2009. Deaths and Death Rates from Extreme Weather Events: 1900-2008. <i>Journal of American Physicians and Surgeons</i>, 14, 102-109, http://www.jpands.org/vol14no4/goklany.pdf</p> <p>Knappenberger, P., Michaels, P., and A. Watts, 2014. Adaptation to extreme heat in Stockholm County, Sweden. <i>Nature Climate Change</i>, 4, 302-303.</p>					
Barbara	Warren	<p>3 Additional organizations</p> <p>June 8, 2015</p>					<p>Please see original comment for response. (this comment is the same, but with 3 additional signatories)</p>

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		<p>The Interagency Group on Climate Change and Human Health US Global Change Research Program US Environmental Protection Agency 1200 Pennsylvania Ave., NW (6207-A) Washington, DC 20460</p> <p>The Interagency Working Group:</p> <p>We appreciate the opportunity to comment on the Draft Climate and Health Assessment. Federal agencies and others outside of federal government have done extraordinary work on climate change in completing the National Climate Assessment and in response to Presidential Executive Orders. We applaud this important and excellent scientific work. We value the body of work that has been produced and hope you will accept this critique in the spirit in which it is intended.</p> <p>Unfortunately this recent effort related to Human Health is not adequate. Part of the problem may be that the purpose of the document was not entirely clear. The Federal Register announced it as a scientific assessment, but titled it as a Climate and Health Assessment. The CDC and other Health organizations have developed guidelines for conducting a health assessment. The report itself makes an effort to describe what this document is NOT. Unfortunately the Working Group failed to clarify what exactly this report would be—if it was not a policy document and if it did not make recommendations.</p> <p>We are facing a crisis of unprecedented magnitude and scope, with both well-predicted impacts and unanticipated impacts. The unfolding crisis will seriously strain our existing public health system. In order to save lives and prevent disease and disability we need a major effort to develop a Comprehensive Health</p>					

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		<p>Assessment, which addresses public health policy and makes recommendations, and is approximately equivalent to the excellent National Climate Assessment.</p> <p>The major concern with this USGCRP Climate and Health Assessment is that it does not really include a Health assessment as defined in the US and actively utilized by state and local health agencies across the US.</p> <p>In fact, it appears as if there was uncertainty regarding the task and the outcome to be achieved. We are told some of what the document was not at p. 24. For example, it is not a policy document. However, it is most definitely not a health assessment.</p> <p>It more closely resembles a literature review, although the document would benefit from a more detailed summary of the peer reviewed literature, the findings and conclusions as well as identification of data gaps.</p> <p>We believe it is a major mistake to not undertake a serious health assessment or at the very least to produce a more limited health policy document related to climate change. First, some health impacts are already being experienced and we need health professionals involved in order to plan for prevention. Prevention is the highest priority for public health professionals and they should play a key role in climate preparedness and community resilience planning in order to save lives and prevent disease and disability.</p> <p>In contrast to this document, the National Climate Assessment was excellent at gathering information and summarizing the evidence and carefully constructing key points. We need a similar robust effort to develop a Health assessment substantively involving many health professionals in various disciplines, but especially those working in public health.</p> <p>The following key messages are from the Human Health Chapter of the NCA and convey the level of effort that went into the NCA:</p>					

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		<ul style="list-style-type: none"> • Key Message 1 states “Climate change threatens human health and well-being in many ways..... and these health impacts are already underway.” • Key Message 2 speaks to existing vulnerabilities and inequities. “Climate change will amplify some of the existing health threats the nation now faces.” • Key Message 3 speaks to the need for public health involvement and to the limits of adaptation. “Public health actions, especially preparedness and prevention, can do much to protect people from some of the impacts of climate change. Early action provides the largest health benefits. As threats increase our ability to adapt to future changes may be limited.” • Key Message 4 addresses health co-benefits. “Responding to climate change provides opportunities to improve human health and well-being.....” <p>A real comprehensive health assessment can enable the development of detailed public health policies related to climate change and prioritize initiatives for funding.</p> <p>Some of the health co-benefits can be obtained on a shorter time frame—providing better health to large numbers of people and saving health dollars simultaneously. Thus transitioning to a clean energy system provides immediate health savings and improved population health. In educating the public immediate or shorter range benefits have significant advantages over longer range predictions about future climate damages.</p> <p>As a nation we have always been better able to talk about economics as a driving force for action, rather than the importance of social or environmental considerations. Health costs are enormous, and those costs alone can provide the driver for reducing greenhouse gas emissions.</p> <p>New York State identified that Hurricane Sandy cost the state \$32 Billion in damages and predicted that climate damage costs would</p>					

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		<p>amount to \$10 Billion on an annual basis. Such costs should enable the appropriate level of investments to prevent worsening climate change.</p> <p>There are many resources concerning Community Health Assessments available from the Centers for Disease Control and Prevention. See http://www.cdc.gov/policy/chna/ Health assessments are data driven utilizing information available on health status, but also related to community resources such as the existing public health system. A serious health assessment needs an adequate framework for assessing public health systematically—utilizing existing data on health, as well as information about existing resources and gaps related to prevention, surveillance and monitoring, public health programs and interventions, education and research.</p> <p>In fact it is not surprising that the existing public health system or infrastructure was not mentioned in this document, nor included in the conceptual diagram provided. Our public health system has been criticized for decades as woefully underfunded and inadequate. In the face of climate change, the situation will become more acute. When we talk about underfunding of national infrastructure we need to talk about far more than roads and bridges.</p> <p>In the context of a Risk Assessment for climate change, this document could be identified as a first step in a risk assessment—Hazard identification. It has identified some of the hazards (not all) associated with Climate change.</p> <p>We recommend tackling the existing document again as a literature review. By providing more discussion of the findings and research gaps, it will be useful to health researchers and other health professionals. However, we do need a more formal Health Assessment, and if that is not possible at this time a more limited health policy document would be useful as a first step.</p> <p>The National Climate Assessment used facts and data well to convey a comprehensive picture of the impacts of climate change. A Health Assessment should do the same.</p>					

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		<p>For example, wildfires result in smoke exposure that has been associated with hundreds of thousands of global deaths annually 260,000 to 600,000 between 1997-2006. (p. 223 NCA) It also cited a 30- fold increase in fine particle air pollution in Baltimore, MD from a wildfire in Quebec in 2002, roughly a thousand miles away. Such information immediately conveys the potential for significant increases in emergency room visits for cardio-respiratory illnesses as well as premature deaths.</p> <p>Fundamental underlying facts aid understanding. For example increasing ambient temperatures leads to more evaporation of volatile organic compounds—which leads to the formation of greater quantities of ozone pollution.</p> <p>The structure and format of the NCA was excellent, and it contained important public health information. This new document needs much more effort.</p> <p>Adaptation needs extensive coverage in a chapter of its own, in order to prepare for multiple climate change threats that can occur simultaneously as well as compounding or cascading health Impacts.</p> <p>Two important concepts were raised at p. 3, but were not really developed further.</p> <p>“While often assessed individually, exposure to multiple climate change threats can occur simultaneously with compounding or cascading health impacts.”</p> <p>“Climate change can therefore affect human health in two ways: first by changing the severity or frequency of health problems that are already affected by climate and weather factors; and second, by creating unprecedented or unanticipated health problems or health threats in places where they have not previously occurred.”</p> <p>The President has issued an Executive Order focused on Adaptation and this report is supposed to be covering health. We appreciate the mention of adaptive capacity – however the</p>					

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		<p>definition refers to communities and institutions as well as people, yet the examples are largely focused on individuals. It is critically important that our government develop the resources to comprehensively deal with adaptation at every level of government and for public and private entities to be jointly engaged in community preparedness and resilience. Our public health infrastructure is in a sorry state, suffering from years of neglect--- and as a result is not capable of playing an absolutely necessary role in community preparedness.</p> <p>For this effort it is essential that we differentiate between access to individual health care and public health needs. Handling a potential Ebola epidemic required significant public health action, beyond patient care.</p> <p>Adaptation or PREPAREDNESS must have a two pronged focus-- not just on preparing to respond to disasters, but preparing for prevention. In other words, what can we do now to prevent certain events or reduce deaths and injuries when an event occurs? Then we need to implement those measures. We also need a fully funded public health infrastructure to reduce deaths, injuries, disease and disability associated with climate change impacts.</p> <p>Integrating public health with other climate science and using health professionals in communicating about climate change.</p> <p>The importance of public health professionals in communicating with the public about climate change has been underappreciated and not well utilized. The public trusts health professionals. Health professionals must be deliberately engaged in Climate Change collaborations, so other scientists can understand the health perspective and in order for public health to be considered one of the climate sciences. We are facing an enormous climate crisis of a magnitude that will impact every aspect of our lives. We must significantly reduce greenhouse gas emissions within 10 years. Yet, a large number of our political leaders deny the reality of climate change. We know that those with vested interests in fossil fuels have deliberately misinformed the public and created a</p>					

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		<p>controversy over the science, where the evidence is overwhelming about the reality of climate change. The Administration’s carbon plan is actually a weak and inadequate effort, but even that plan is being fought as if it will cause havoc on the economy.</p> <p>Cascading Failures to Essential Infrastructure was discussed. However, the continued failure to consider existing technological hazards and their interaction with climate change is serious.</p> <p>We cannot be prepared for climate change if we ignore existing hazards in our communities. Advanced technology has connected many of the systems in modern society to each other. This results in the potential for additive and synergistic adverse impacts to a single event. We appreciate the mention of our aging infrastructure and the lack of investment in it. The recent grade of D + should be mentioned here by the American Society of Civil Engineers. In the context of the hazards of an extreme event and related cascading failures, that can be catastrophic, we must begin to include existing technological hazards that are part and parcel of our modern lives in all climate assessments. Extreme weather events do not only involve wind, water, microbes, human sewage and fire. Extreme weather events interact with a host of different kinds of hazardous facilities, hazardous chemical storage, nuclear sites and radiological facilities, degraded 100 yr. old pipelines, etc.</p> <p>The fact that climate change is connected to weather and previously occurring natural events, has obscured our ability to grasp the magnitude of what we must be prepared for. A large measure of denial is also operative, given that we know Hurricane Katrina and flooding, and subsequent events have resulted in the dispersal of toxic chemicals. No scientists however should be under such delusions. Following March 2011 and the earthquake and tsunami in Japan, the Japanese government was forced to focus on the much more dangerous unfolding nuclear disaster, rather than the desperate human needs of the area population related to the tsunami. While this was not a climate related disaster, it provided a clear illustration of a cascading failure related to our collective societal hubris that underlies our belief in our ability to handle all the technological hazards we have created. We have had multiple recent examples: Freedom Industries in West Virginia released</p>					

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		<p>toxic chemicals that shut down the local water supply. In an extreme rainfall event affecting the area around Boulder, Colorado, tanks of toxic chemicals associated with hydraulic fracking were overturned and dispersed. In New Mexico, wildfire threatened the Los Alamos nuclear site and radioactive materials in storage there.</p> <p>In order to prepare for climate change and extreme weather events, we must understand everything about local communities, including the location and nature of existing and hazardous facilities. To date none of the national climate reports touch on such hazards. We are only aware of one produced by the non-profit organization, Center for Health, Environment and Justice, related to Climate change and Superfund sites. In Western NY we have a former nuclear reprocessing facility located on a site that is actively eroding. Long lived radioactive materials buried there may not be possible to contain, given increasing extreme rainfall events, thus jeopardizing Lake Erie and the drinking water for millions.</p> <p>Preparing communities to deal proactively with such hazards may be cost effective and avoid diverting essential emergency response from human needs during a disaster.</p> <p>The Conceptual Diagram presented for Climate Change & Health is useful, but needs improvement. (p. 4)</p> <p>This is a useful conceptual diagram, but it must be improved. Public health infrastructure matters a lot in determining the health outcomes of climate change. It must be given more importance. Public health infrastructure does not mean a building, but all the kinds of people and resources necessary to accomplish all the core public health functions.</p> <p>We wonder whether there should be separate diagrams to talk separately about more chronic, long term effects of climate change versus extreme weather events that cause acute impacts.</p> <p>Points on the diagram:</p> <ul style="list-style-type: none"> • Deaths and injuries and disabilities need to be included as health outcomes. 					

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		<ul style="list-style-type: none"> • The title “Non-Climate Stressors” is an inadequate descriptor. <p>Existing Community Hazards must include industrial facilities and other sources of hazardous chemicals, fuels and radiologicals. Thus far federal climate change documents almost totally ignore the reality of multiple technological hazards that will interact with climate change events.</p> <p>This needs immediate correction or communities will not be prepared.</p> <ul style="list-style-type: none"> • The existing underfunded public health infrastructure should be included in the blue pathway prior to health outcomes. We need to acknowledge the difference between public health programs and access to individual care. Public health must have a sizeable role in all adaptation efforts at the national, state and local community levels—or we will not be prepared. • In the blue pathway, existing major health problems and inequities should be included after exposure pathways followed by the underfunded public health infrastructure. <p>Social and economic inequities are systemic and impact health status and vulnerabilities of many communities in the US. We appreciate the attention given to Populations of Concern in this document, however there is much more work to be done to prepare for Climate Change. We urge a much more comprehensive effort to produce a real Health Assessment that accounts for our health system and its inadequacies, the existing burden of disease as well as the long standing inequities that will be exacerbated as a result of climate change.</p> <p>Please address questions to B. Warren at 845-754-7951.</p> <p>Respectfully submitted,</p>					

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		Damascus Citizens for Sustainability NY Buck Moorhead Chair NYH2O NY Joe Levine Director Citizens for Water NY					